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# LAUNDERING OF WOVEN WOOL FABRICS IN A MODERN HOME WASHING MACHINE

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**The modern home washing machine offers many controls over the washing process not found on earlier models. These changes have resulted in milder washing procedures to accommodate new fibers, finishes and fabric constructions. The washability of wool fabrics under such mild conditions was therefore re-evaluated in a typical domestic washer.**

**Shrinkage of untreated wool fabrics could be decreased by reducing the washing time and the speed of the agitation and spinning merely by appropriate setting of the machine controls. A secondary factor for reduced shrinkage was a high water-to-fabric ratio, while the water temperature, within the range available, seemed unimportant.**

**Based on a study of the effects of variables in the laundering process, a wide variety of commercial wool fabrics was subjected to repeated washing by an optimum procedure. Even after 10 repeated cycles, over one-third of these fabrics exhibited shrinkages in area of 10% or less.**

## INTRODUCTION

WIDESPREAD use of washing machines in home laundering is indicated by the 41,175,000 machines reportedly in use January 1, 1957, in the United States; in 86.8% of the homes wired for electricity, washing machines have been installed. Increased use of washers is noted since 1952 when only 73.5% of the homes had washing machines (*1*).

Not only have domestic washers in use increased in number in recent years, but the type of equipment available to the consumer is now considerably different from that purchased only a few years ago. Available data (*2*) indicates that, in 1949, less than 30% of the home washers sold could be described as automatic or semi-automatic, whereas by 1956, about ¾ of the unit sales were of the automatic type.

The modern home washing machine permits increased control over many of the steps in the laundering process. Indeed, it may be suggested that many aspects of this control have come about to permit milder washing action for synthetic fabrics and the newer finishes. Thus, most brands of present-day machines provide two levels of agitation: a "regular" cycle and a "milder" cycle which is specified for "delicate", "modern", or "synthetic" fabrics depending on the particular machine.

In America, wool is not often regarded as a machine-washable item in the home. Instruction booklets for domestic washers refer to woolens at most as a specialty item. It is probable that most consumers do not think of wool fabrics as machine-washable although some 10 million pounds of wool are now treated for shrink resistance annually (*3*).

In this connection, it is interesting to recall that a high point in the research and development activity in shrinkproofing of wool in this country and elsewhere took place during World War II. Thus, evaluations of processes and products were made in washing equipment of the time employing severe conditions of test. Additionally, much of the emphasis was on application of antifelting processes for military fabrics, an end use with further implications for severe laundering.

To accommodate fabrics from newer fibers, the modern washing machine has many more controls than did those of only a few years ago. Since it allows for milder machine washing, it is timely to consider felting of wool during laundering anew. Two pertinent questions then arise:

1) Does the use of the modern washer under optimum conditions produce sufficiently little felting shrinkage of woolens so that the basic position of washable wool is greatly improved?

2) Can wool fabrics be engineered (in terms of fabric and yarn construction) to give improved washability under favorable modern washing conditions so that either no antifelt treatment, or, at most, only a very mild treatment will be required?

The Wool Bureau and the International Wool Secretariat are supporting a research program at these laboratories to provide answers to these questions. This paper is directed to the first question and gives the initial results of studies of the shrinkage behavior of wool fabrics in a modern home washer.

## EQUIPMENT AND MATERIALS

For this project, a typical 1957 automatic washer was selected——Maytag Model 140——embodying the controls found on most other brands of agitator washers. This machine has the following features: 1) a regular and a reduced agitation and spin speed, 2) cold, warm and hot water selection, 3) a choice of one to fifteen minutes sudsing time, and 4) normal, medium and low water level choice.

The "modern" fabrics setting gives an agitation and spinning speed of 36 oscillations/min and 415 rpm respectively, one-third less than the "regular" fabrics setting (54 oscillations/min and 620 rpm). The cold selection provides cold tap water temperature (60-75°F); the warm water setting is thermostatically controlled at 100°F; hot water depends on the temperature of the hot water supply, in this case 140-150°F. Rinse water, using the hot and warm settings, is 100°F; cold rinse water is used when cold

water is selected for washing. The normal water level is seven and one-half inches in the tub with no load; setting to medium water level or to low level fills the tub to five and one-half or three and one-half inches, respectively. The cycle sequence includes: 1) washing time as preset, 2) spin period during which the water is spun out by centrifugal force, 3) a rinse effected as the tub continues spinning as the water enters, 4) further spinning, 5) a rinse in the filled tub, and 6) spinning to expel the water until the load is damp dry. A cycle with a three-minute sudsing time requires approximately 20 minutes for completion.

The dryer selected for use in one phase of the study was an electric Maytag Model 640W. Temperature selection may be made from low (140°F), medium (158°F), and high (172°F) settings. The time control allows automatic settings up to 120 minutes. There is a five-minute cooling period at the end of the drying cycle.

The test fabric used in the initial investigation of laundering variables was a 10-oz unfinished wool flannel, considered to be relatively feltable. Fabric specimens were cut 12″ x 12″ with reference markings made one inch from the cut edges. Three warpwise and fillingwise measurements were taken for all shrinkage determinations. Fabrics were first relaxed by wetting out in a 0.1% solution of Triton X-100 for one hour. They were then washed in a commercial light-duty detergent with an alkylarylsulfonate base, using one-half cup per load as recommended. The load was three pounds of dry fabric in all cases. All shrinkages were calculated based on the relaxed dimensions.

## RESULTS AND DISCUSSION

In order to obtain a screening of comparative effects of a mild and a severe laundering in this machine, a test covering broad ranges of conditions was undertaken. The milder procedures employed the "modern" fabrics setting and cold water with suds times of five or 15 minutes; the more severe procedures were run with the "regular" more rapid agitation cycle and warm water, using the same wash times. After completion of the first laundering, the specimens were air-dried and measured for shrinkage. They were then rewet and centrifuged in the washer and tumble dried in the automatic dryer at two different temperatures; drying times were selected sufficient to bring the load to a condition judged dry to the touch. The tests were continued through three cycles of laundering and automatic drying. The data are summarized in Table I.

### TABLE I

**Felting shrinkage of wool flannel in laundering and drying using mild or severe procedures**

| Washing conditions[a] Agitation and water temp setting | Suds time (min) | Felting shrinkage in one wash[b] W (%) | F (%) | Drying conditions[c] Temp (°F) | Time (min) | Felting shrinkage in one drying[c,d] W (%) | F (%) | Total area felting shrinkage[e] 1 cycle (%) | 3 cycles (%) |
|---|---|---|---|---|---|---|---|---|---|
| "Modern"—cold | 5 | 2.5 | 0.8 | 140 | 60 | 5.4 | 1.2 | 9.7 | 24 |
| | | 3.4 | 1.0 | 172 | 35 | 6.7 | 0.8 | 12 | 22 |
| | 15 | 7.9 | 2.4 | 140 | 60 | 7.4 | 2.3 | 19 | 32 |
| | | 7.7 | 2.2 | 172 | 35 | 4.8 | 1.0 | 15 | 32 |
| "Regular"—warm | 5 | 8.8 | 2.8 | 140 | 60 | 4.0 | 0.7 | 16 | 29 |
| | | 9.8 | 2.9 | 172 | 35 | 5.2 | 1.2 | 19 | 25 |
| | 15 | 11 | 4.8 | 140 | 60 | 5.7 | 1.2 | 22 | 35 |
| | | 12 | 4.3 | 172 | 35 | 3.9 | 0.7 | 20 | 34 |

[a]Three-pound load and low water level in all cases.
[b]After air drying.
[c]Electrical tumbler dryer as described in the text.
[d]Based on dimensions of fabrics after one laundering and air drying.
[e]Laundering plus tumbler drying.

### TABLE II

**Felting shrinkage[a] as related to washing variables—water level and washing time**

| Water level | Washing time[b] (min) | Area felting shrinkage in laundering % 1 cycle | 2 cycles | 3 cycles |
|---|---|---|---|---|
| Low (3½″) | 3 | 3.2 | 7.1 | 11 |
| | 5 | 7.2 | 12 | 17 |
| | 9 | 9.2 | 16 | 20 |
| | 14 | 12 | 21 | 27 |
| Medium (5½″) | 3 | 5.7 | 9.4 | 12 |
| | 5 | 6.8 | 10 | 15 |
| | 9 | 9.8 | 15 | 19 |
| | 14 | 10 | 15 | 21 |
| High (7½″) | 3 | 3.9 | 7.0 | 11 |
| | 5 | 5.8 | 9.8 | 12 |
| | 9 | 8.4 | 13 | 16 |
| | 14 | 9.1 | 15 | 20 |

[a]Relaxed lightweight wool flannel was used. The load (dry) consisted of three pounds. Warm water (approximately 100°F) and "modern fabric" agitation were employed.
[b]Washing time refers to the initial period when the fabric is in contact with the suds. Total laundering takes approx 17 minutes longer than times listed.

### TABLE III

**Felting shrinkage[a] as related to washing variables—mechanical agitation and water temperature**

| Agitation-spin speed | Water temp[b] setting in suds step | Washing time (min) | Area felting shrinkage (%) 1 cycle | 3 cycles | 10 cycles |
|---|---|---|---|---|---|
| Slow (modern) | cold | 3 | 4.5 | 8.4 | — |
| | | 5 | 5.0 | 11 | — |
| | | 9 | 8.5 | 14 | — |
| | | 14 | 14 | 21 | — |
| Fast (regular) | cold | 3 | 7.0 | 15 | — |
| | | 5 | 8.1 | 18 | — |
| | | 9 | 11 | 23 | — |
| | | 14 | 15 | 30 | — |
| Slow (modern) | cold | 3 | 4.5 | 8.4 | 19 |
| | warm | 3 | 3.9 | 11 | 23 |
| | hot | 3 | 4.7 | 9.5 | 23 |

[a]Relaxed lightweight wool flannel fabric, three-pound load and 7.5″ water level were used.
[b]Cold water was 60°–75°F; warm water was approximately 100°F, and hot water was 140°–150°F. Rinse water was the same temperature, warm, for the warm and hot washes and cold with the cold washes.

The results show the expected effect of wash time——an increase in felting with increased time of laundering. The milder procedure, produced by reduced agitation and water temperature in this case, does indeed produce less shrinkage. Thus, in this series of tests, it was found that a mild 15-minute wash produces similar felting shrinkage as a five-minute wash of severer magnitude. No appreciable difference in felting shrinkage was noted in the fabrics dried a short time at a high temperature or a longer period at a lower temperature in the dryer after three laundering cycles. However, in these tests, tumble drying added such a considerable amount to the total felting shrinkage that its use was eliminated in favor of air drying for further testing of laundering variables. Other experimental work on drying has been planned and will be discussed at a future date.

The variables in laundering were isolated in a more detailed way in the next series of experiments. The effect of three water levels at various washing times is presented in Table II. Again, the rate of felting shrinkage increased as the washing time was increased. Increasing the water level tended to decrease the felting shrinkage, especially with longer washing times. This result is consistent with the observations of the shrinkage of wool top (*4*) as a function of water level in a tumbling test for felting. A reasonable explanation of this effect lies in the decreased frequency of contact of the fabric specimens as larger volumes of water are used. Carter et al (*5, 6*) have also demonstrated the same effect in the washing of knit goods by alteration of the wool-to-liquor ratio. Table III gives the findings from washing tests involving slow and fast mechanical agitation during washing cycles of varying length. Increasing the agitation-spin speed resulted in corre-

sponding increases in felting shrinkage. Furry and O'Brien (7) have also reported that shrinkage in a lightweight wool challis was directly related to the magnitude of agitation of the fabric during laundering, and Davidson (8) has observed this effect as well. The magnitude of the effect in the present case was surprising, however.

The effect of varying the temperature of the wash and rinse water also appears in Table III. Water temperature within the range studied appears to be a relatively minor factor in felting shrinkage during a few mild laundering cycles in an automatic washer; cold water produced slightly less felting shrinkage than the warmer temperatures after ten mild launderings. A good deal of work has been done and considerable controversy has existed over the question of the temperature effect in felting. Freney (9) has thoroughly reviewed the earlier literature in this field. Without entering this controversy, we believe that it is a widely held lay view that high temperatures are to be avoided for minimum shrinkage. Carter et al (5, 6) report statistically significant higher shrinkages in a washer with increasing water temperatures. The fact is, however, that the temperatures operating during the *total* laundering cycle in the modern machine do not cover a very wide range when the suds time is short; with both warm and hot water settings, it will be recalled, the rinse and spin steps automatically occur at 100°F for 17 out of the 20 minutes. Thus, in mild laundering situations, it appears that water temperature is not an important factor.

From the laundering variables considered, the following mild laundering conditions were established for further work: three pounds of dry fabric, high (normal) water level, "modern" fabrics setting, warm water, one-half cup detergent, three-minute washing time (approximately 20-minute total cycle) and air drying. This procedure was found to clean soiled, white wool flannel fabrics satisfactorily. The felting shrinkage of a wide array of commercial fabrics was examined with a view to determining their behavior in this milder washing procedure. The results are briefly given in Table IV.

Those results show a wide array of shrinkage behavior as would be found is such a diverse group of constructions and styles of fabrics. More striking, however, is the relatively large number of commercial materials that exhibit low levels of felting, eg, more than one third of the samples show 10% or lower shrinkage in area after 10 wash cycles.

**TABLE IV**

**Felting shrinkage of 75 commercial all-wool fabrics in 10 mild launderings[a]**

| No. of fabrics | Percent of the total no. tested (%) | Range of shrinkage in area observed (%) |
|---|---|---|
| 9 | 12 | less than 5 |
| 19 | 25 | 5–10 |
| 17 | 23 | 11–14 |
| 19 | 25 | 15–24 |
| 11 | 15 | more than 24 |
| Total 75 | 100% | |

[a]*Wash conditions:* modern fabrics agitator-spin setting, warm water, high water level (normal setting), three min suds time (20 min total), three lbs load, one-half cup light duty detergent, air drying. Fabrics were relaxed prior to washing.

**TABLE V**

**A comparison of felting shrinkage of commercial fabrics in mild and severe laundering in a modern washer**

| | Area felting shrinkage (%) | | | | |
|---|---|---|---|---|---|
| | Mild laundering | Severe laundering | | | |
| | 10 | 1 | 2 | 3 | 5 |
| Sample | cycles | cycle | cycles | cycles | cycles |
| 3[a] | 1.1 | −0.5 | 0.3 | 0.3 | 1.1 |
| 4 | 6.4 | 3.4 | 4.1 | 4.7 | 6.6 |
| 19 | 8.4 | 5.4 | 10 | 11 | 17 |
| 17 | 10 | 7.6 | 11 | 14 | 19 |
| 12 | 10 | 6.6 | 12 | 16 | 26 |
| 2 | 12 | 6.2 | 11 | 16 | 26 |
| 7 | 14 | 9.8 | 15 | 18 | 24 |
| 14 | 15 | 11 | 16 | 21 | 29 |
| 10 | 15 | 10 | 17 | 22 | 31 |
| 13 | 20 | 14 | 18 | 23 | 30 |
| 18 | 25 | 15 | 24 | 32 | 42 |
| 15 | 33 | 19 | 32 | 42 | 54 |
| 6 | 52 | 27 | 47 | 59 | 70 |

[a]Shrink-resistant wool.

While the evidence is clear that the proposed wash procedure is of low severity, it was thought useful to compare the commercial fabrics in the new washer, contrasting the new mild wool procedure with a typical but more severe procedure. A selection of the commercial fabrics covering a range of felting patterns was made; in addition to the standard mild test, a more severe laundering series was run. Only the two factors in laundering which contribute in an important way to felting were altered: the agitation was increased by using the "normal" setting, and the suds time was increased to nine minutes. The comparison is given in Table V. The area felting shrinkage after ten mild cycles was approached in approximately two cycles of the severer laundering in the majority of cases. After five severe laundering cycles, the felting shrinkage of many of the fabrics was about twice that observed after 10 mild cycles. This confirms the view that the laundering procedure chosen for use in testing is reasonably mild. It further emphasizes that a milder washing procedure is readily available to the consumer with modern laundering equipment, and its use should extend the opportunity for launderability of wool if other conditions and requirements for washability are met.

Such problems as the role of construction in inherent feltability under modern laundering conditions, and the requirements, if any, for shrinkproofing treatments will be considered in subsequent studies.

## CONCLUSIONS

A study of the effects of the controllable variables in the use of a modern domestic washing machine has been made. Of these variables, the speed of agitation and spinning (controlled by push-button selection of "regular" or "modern" fabric settings) and wash time exert the maximum effect on the felting observed. As a result of these investigations it is possible to set forth an optimal mild washing procedure for wool which conforms to the dictum of Labarthe (10), viz, minimum care fabrics should only require washing procedures comparable to those customarily used by the purchasing family. The results show that the feasibility of washing wool garments with ordinary home laundering methods has increased because of the versatility of modern domestic washing machines.

## ACKNOWLEDGEMENT

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# AN AUTOMATIC UNIT FOR THE CONTINUOUS MANUFACTURE OF SODIUM HYPOCHLORITE

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**This paper describes an automatic sodium hypochlorite unit recently installed in the bleach house at Crompton-Shenandoah Company. The advantages of this new unit over the "batch system" of manufacture previously used are described in full. A description of the equipment used in the unit, as well as the operation of the unit, is described. Also included are two photographs and a schematic drawing of the unit.**

**This automatic sodium hypochlorite unit was one of the first to be used in the textile industry.**

## INTRODUCTION

AN automatic sodium hypochlorite unit (Fig 1), now operating in the bleach house at Crompton-Shenandoah Co, was designed and developed by the Chemical and Engineering Departments of the plant to manufacture sodium hypochlorite continuously. Previously, sodium hypochlorite was made by the "batch system," utilizing soda ash as a buffer.

The automatic unit affords many advantages over the old system of manufacture. The strength of the hypochlorite is held constant, continuously. The sodium hypochlorite is manufactured at the same rate at which it is used. A comparatively small area is required for the manufacturing equipment. A buffer or stabilizer is not required. A minimum of manpower is needed in the manufacturing process. The need of constant safety training is minimized as all of the reacting is done automatically. Chlorine is purchased in tank car lots and run directly into the unit, thus eliminating the storage area that was required for the cylinders previously used. There is no storage area needed in the bleach house for the chemicals used in the manufacturing process. The consumption of caustic soda, chlorine and water has been substantially reduced although a similar strength bleach is being manufactured. The cost of manufacturing sodium hypochlorite by this new process is substantially reduced. With an automatic sodium hypochlorite unit, only a slight excess of caustic soda is required and the need of a buffer is eliminated.

In seven months running time, the automatic sodium hypochlorite unit realized a large enough savings to pay for the unit and its installation.

## OPERATION OF THE UNIT

DESCRIPTION——Liquid chlorine is piped from the tank car to the automatic unit through heavy-duty welded steel pipe. The liquid chlorine enters the unit through a glass-wool filter for removal of foreign matter. It is then conducted through a vaporizer, which is heated by hot water at 180°F, where it is converted from the liquid to the gaseous phase. From this point the chlorine gas passes through the air motor control valve to the injector, at which point it is absorbed in the circulating solution.

The unit produces sodium hypochlorite at the same rate as the input of water and liquid caustic soda. Caustic soda is pumped from the storage tank through a flowrater, which is controlled by a hand valve. The flow of water and caustic soda are maintained at a definite ratio. The water and caustic soda are mixed and then added to the circulating system through a Duriron pump, which circulates the reacting mixture at a rate of 30 gal per minute through the chlorine injector.

The concentration of the sodium hypochlorite is controlled by a Foxboro redox recording instrument (Fig 2), which receives a controlling input signal from the silver-platinum electrodes immersed in the reaction tank. The millivolt potential produced by the electrodes is a function of the sodium hypochlorite strength and the excess caustic soda. This potential actuates the instrument, which in turn controls the chlorine-control valve. The instrument will control the concentration of the sodium hypochlorite produced within very narrow limits; however, as a safety factor, the instrument is set so that the concentration of available chlorine in the bleach varies from 2.3% to 2.7%.

SAFETY DEVICES —— Several safety devices have been incorporated in the unit. In the event that the hot water supply to the vaporizer is cut off, the chlorine valve closes immediately so that liquid chlorine will not pass into the reaction tank. Likewise, if there is a power failure, the chlorine valve will close, preventing excess chlorine from entering the reaction tank.

OPERATION —— The following procedure is followed in starting and stopping the automatic sodium hypochlorite unit. (See Figure 3).

1) The hot water valve is opened to supply heat to the vaporizer.
2) Switch #1 (Fig 2) on the panel board is turned to the "on" position allowing the caustic pump to start and the water supply valve to open.
3) Switch #2 is turned to the "on" position, which starts the circulating pump.
4) Switch #3 is turned to the "on" position, which feeds current to the Foxboro Recorder.
5) The signal light will come on, indicating that the vaporizer has come to operating temperature, at which time the main chlorine valve is opened.
6) The set point on the instrument is moved from zero to the 505 millivolt position, at which time the instrument takes over the automatic control of the unit.
7) The unit is shut off by reversing the above procedure.

CHLORINE TANK CARS——The chlorine from the supply tank car must be measured by some means to determine when the car is becoming empty. In order to determine this, a log is kept handy by the operator recording the air pressure supplied to the control valve by the control instrument. The control valve normally remains about one-quarter open at seven psi. When the pressure begins toward the 15-lb level, this indicates that the valve is opening to full open to meet the demand for chlorine in the reaction tank, the tank car pressure has reduced, and the car is empty. At this point the operator closes the valve on the empty car and opens the valve on the full car. Since there is about a two-hour supply in the chlorine line to the cars, the switch engine can remove the empty car without interrupting the operation of the unit.

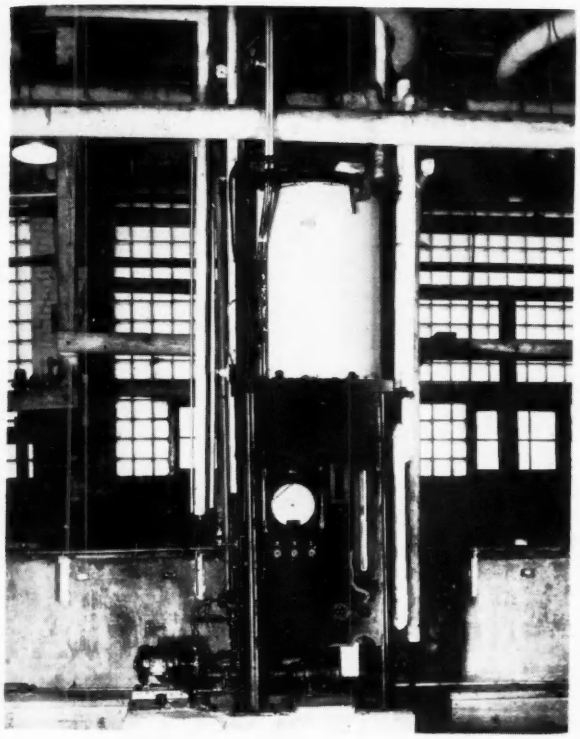

**Figure 1**
**Front view of the automatic sodium hypochlorite unit**

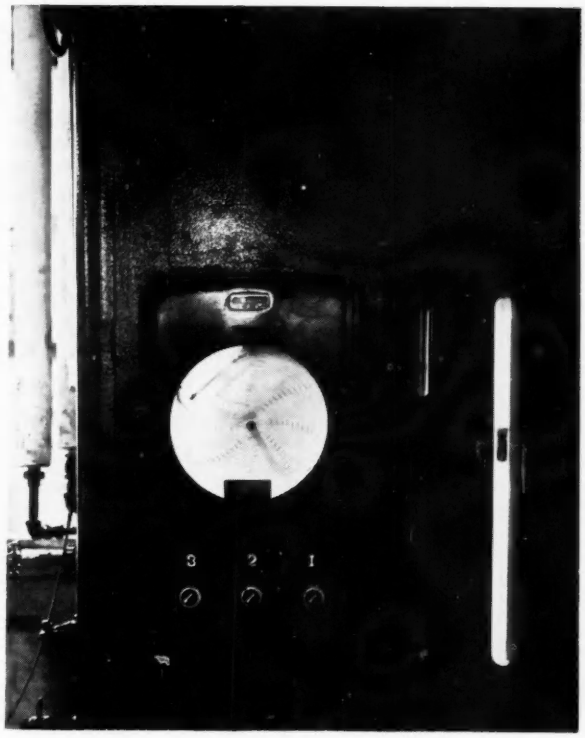


**Figure 2**
**Control panel showing (l to r) Foxboro oxidation reduction potential recorder, water and caustic flowrater**

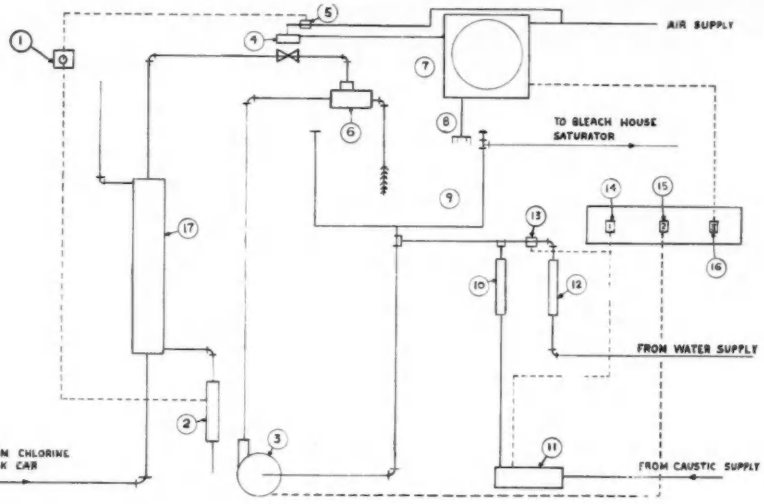


**Figure 3**
**Schematic drawing of present sodium hypochlorite unit at Crompton-Shenandoah Co**

1—bulb & switch box
2—thermostat
3—circulating pump
4—air motor valve
5—solenoid valve
6—injector
7—recording instrument
8—electrodes
9—rubber-lined tank
10—caustic flowrater
11—caustic pump
12—water flowrater
13—solenoid valve
14—switch to caustic pump & solenoid valve
15—switch to circulation pump
16—switch to instrument
17—vaporizer
——pipe
- - - -electric wiring

WATER SUPPLY——There are two sources of water that are economically usable at Crompton-Shenandoah Company, spring water and city water. The unit was originally set up using city water, but because of the low cost of the available spring water an attempt was made to utilize it in the unit. Trials proved, however, that the pressure of the spring water varied so widely that it was necessary to return to the use of city water.

CAUSTIC SODA STORAGE——The automatic sodium hypochlorite unit utilizes 50% liquid caustic soda, which is transferred from tank cars to a steel storage tank of 22,000 gals capacity. This tank is located in a separate building, which is kept at

room temperature. The caustic soda is pumped directly from the storage tank to the unit.

EQUIPMENT ——— The reaction tank is made of steel with a Saran-rubber lining. The pipe from the chlorine tank car to the unit is heavy-duty welded steel pipe. The piping in the unit is made from vinyl chloride polymer, as is the piping from the reaction tank to the saturators. The redox recording instrument (Fig 2) is a Foxboro EMF Dynalog ORP (Oxygen Reduction Potential) Recording Controller. The system utilizes a silver and platinum electrode. The base of the electrodes and the wiring leading from the electrodes to the recorder is sealed in Tygon tubing to prevent the possibility of a short circuit. There are caustic and water flowraters, descriptions of which follow:

*Water Flowrater* (Fig 2)—The water flowrater is a size 6 precision accuracy flowrater meter having ¾-in horizontal screwed connections of steel construction and a Type 316 stainless-steel metering float with 600 MM pyrex glass metering tube for measuring a maximum of 9.6 gpm and a minimum of 1.75 gpm. The scale reads directly in gpm with an auxiliary millimeter scale.

*Caustic Soda Flowrater* (Fig 2)—The caustic soda flowrater is a size 4 armored metal tube meter with over-mounted magnetic indicator having one-inch, 150-lb ASA flange connections and all parts (wetted by fluid) of Type 316 stainless steel.

The body of the chlorine valve is made of stainless steel with the trim being made of Hastalloy C with Teflon packing, gaskets and seats. The caustic pump is a frame I 12 Type CSQ with iron castings, internals and rotor and an Ameripol synthetic rubber stator. This pump has a maximum capacity of 1.5 gpm. The circulating pump is a Duriron #40 Pump with a 40-ft head and a maximum capacity of 30 gpm.

## SUMMARY


The following is a brief description of the "Batch System" of manufacturing sodium hypochlorite previously used:

Soda ash is added to water and brought to the boil in a steel tank. After cooling, this solution is dropped into a concrete tank. To this solution is added caustic soda and then a cylinder of chlorine (liquid) is added to the mix. It requires one and one-half hours for the chlorination to be completed and the bleach cooled sufficiently to be added to the saturators. In an eight-hour working day five to six batches of bleach will be consumed.

The automatic sodium hypochlorite unit need only be turned on at the start of the day and it will run automatically as long as needed. The unit will hold the strength of the bleach constant, and will manufacture the bleach at the same rate at which it is being picked up by the goods being bleached.


# Abstracts

## The Future of Nonwoven Fibers

Rudo, S I, *Canadian Textile J* **75**, 80-1, March 7, 1958

Present indications are that nonwovens will emerge as a new industry, the author states. Their future potential and implications will affect not only the textile but also the paper, chemical, plastics and rubber industries.

Production of nonwoven fabrics in 1957 was 90 million pounds, and it is estimated that it will double during the next three years.

Following are some of the end-uses of these fabrics in fields where they have become well established:

*In the industrial field*: filters, insulation against heat and electricity, wiping cloths, reinforced plastics, padding, backing for coated fabrics, and in the luggage and automotive industries.

*In the household and sanitary markets*: napkins, tablecloths, towels, draperies, backing for upholstery, bed pads, dressings, sanitary products, diapers and bibs.

*In the apparel market (which is at present relatively the smallest in the nonwoven field)*: interlining, padding, petticoats, aprons, skirts, etc.

This list comprises nonwovens of both the disposable and nondisposable types. The disposable items have the larger volume and utilize lower priced fibers and waste fibers in general.

The author anticipates increased utilization of both types. He suggests that in the distant future we may have disposable shirts, or even suits, made of nonwovens. He points out that these bonded fabrics lend themselves more than any other textile material to engineering for end-use and to automation.

New products envisioned for the near future and now in the process of research or in the pilot stages are leather-type articles for the shoe industry, upholstery and bookbindings, disposable work clothing for medical and industrial applications, printed materials for outerwear uses, etc. The most urgent problems to be solved are how to impart fashion and style to nonwoven products; how to engineer better seam strength, heat sealing, softer hand and controlled reproducible quality.

A comparison of the volume of nonwoven fabrics with that of fabrics of all types, based on 1957 figures and 1960 estimates, is given in the following table:

| | *Nonwoven fabrics* | | *All-type fabrics* |
|---|---|---|---|
| *End-use group* | *Present volume* | *Estimated volume for 1960* | *Present total volume* |
| | (in million pounds) | | |
| Industrial fabrics | 55 | 85 | 1500 |
| Home furnishings, including sanitary textiles | 20 | 55 | 2300 |
| Apparel uses | 15 | 60 | 2600 |
| Total | 90 | 200 | 6400 |

## New Technique for Sodium Chlorite Bleaching

Anon, *Pakistan Textile J* **8**, 65-6, December, 1957.

The author describes a new chlorite bleaching method, which is said to offer many important advantages in spite of the high price of sodium chlorite.

In a new technique devised in Germany and made under license by Sir James Farmer Norton & Co, Ltd, the cotton fabric passes through the singeing machine and is quenched in the usual way, and then passes straight into the impregnation box in front of the steamer and then into the steamer itself to be desized. A temperature of 70°C is used in the steamer, and desizing is carried out using a diastase. After desizing, the fabric runs straight into the first compartment of the washing machine, where it is boiled in a sodium carbonate solution. It is squeezed at the end of the washing machine to 60 percent expression. The fabric is then taken round to the entering end of the machine and run into the impregnator, saturated with the sodium chlorite solution, and squeezed, giving a pick-up of 50 percent. It then passes from the impregnator into the steamer, where it is stored for one hour at 90°C.

For bleaching cotton, a solution of 40 gpl is put into the impregnation tank. The process is also adapted to linen bleaching, for which a larger

(*Concluded on page 400*)

# *Proceedings of the*

# American Association of Textile Chemists and Colorists

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Western New England and Rhode Island Sections———

# SOME ASPECTS OF CELLULOSE REACTIVE DYES AND PRACTICAL EXPERIENCE IN THEIR APPLICATION*

FERNAND SCHLAEPPI

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*Ciba Co, Inc*

**This paper is addressed to dyers and colorists who are concerned with the use of cellulose reactive dyestuffs. In order that the various phases of application may be readily understood, the fundamental principle of these new dyes, and their chemical and physical behavior are explained. The main part of the paper is based on the writer's practical experience with Cibacron dyes, and its aim is to show how these dyes may best be applied for economical production. The procedures for pad and exhaust dyeing and the different methods of fixation are discussed, giving special consideration to the types of equipment generally available. Direct, discharge and resist printing are also described. Reference is made to the fastness properties, including lightfastness after resin finishing.**

## INTRODUCTION

With the recent introduction of cellulose reactive dyes, we are witnessing and indeed experiencing a development of far-reaching significance in the dyeing and printing industries. It is an exceptional occasion when a range of dyes based on a fundamentally new principle is made available. The difference between conventional methods of attaching dyestuffs to fibers and the new method involving reactive dyes may perhaps be illuminated by discussing the definition of dyeing from the *Encyclopedia Britannica*, which states: "The art of colouring textiles or other materials in such a way that the colour appears to be a property of the dyed material and not a superficial effect such as that produced by painting". This postulate can be met in two principle ways:

*Physical adsorption*, as for example with substantive dyes. This process is easily reversed, desorption accounting for the bleeding and the corresponding loss of depth on wet treatments.

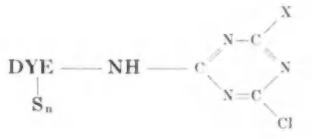
*Mechanical retention of insoluble pigments within the fiber*, as in dyeing with vat, azoic and sulfur dyes, or in the incorporation of pigments in the mass of man-made fibers.

Advantages and disadvantages of such methods are well known. In both these cases "the color *appears* to be a property of the dyed material". However, in the case of reactive dyes, the dyestuff molecules combine chemically with the molecules of the substrate, and therefore the color no longer *appears to be, but actually becomes* an intrinsic property of the dyed material. This has been a dream of many dyestuff chemists, and dyes with reactive groups have been known for a long time. Some thirty years ago, Ciba produced such dyes by means of incorporating cyanuric chloride in suitable azo groups. However, at that time no interesting technical application could be found. The practicality of the principle of reactive dyes has only recently been achieved with any degree of success. The first types of reactive dyes for wool were placed on the market in 1950 by Hoechst in Germany: Remalan Yellow and Remalan Blue. Later Ciba introduced three reactive dyes, viz, the Cibalan Brilliant types, which are used for wool and polyamide fibers. The first commercial reactive dyes for cellulose were marketed by Imperial Chemical Industries in England under the tradename of Procion *(1)*. In the course of the further development of the Cibalan Brilliant series, Ciba succeeded in producing the Cibacron dyes, which will also react with cellulosic fibers.

*Presented before the Western New England Section on December 13, 1957 and before the Rhode Island Section on January 30, 1958.

## BASIC CHEMISTRY OF CELLULOSE-REACTIVE DYES

The consideration of some of the basic chemistry underlying the cellulose-reactive dyes should greatly contribute to a clearer understanding of the many different methods of application and the attainable fastness properties. Chemically the cellulose molecule is comparatively inert. Chemicals to be combined with cellulose must therefore themselves be highly reactive, but should not adversely affect or degrade the cellulose fiber. Such chemicals were found in cyanuric chloride derivatives, which can be used as linkage groups between the dyestuff and the cellulose molecules. Reactive dyes on this basis would correspond to the following chemical formula:




"DYE" represents the chromophor, such as an azo, anthraquinone or phthalocyanine structure with sulfo groups ($S_n$), and X stands for another chlorine atom, or for an inactive radical, which may contain a solubilizing group. Such dyestuffs are readily water-soluble and have a relatively low substantivity for cellulose.

Products with two chlorine atoms in the cyanuric radical are more reactive than derivatives with only one chlorine atom. Both types have advantages in their application. Whereas the monochloride types are highly stable in aqueous solutions and do not become hydrolized even with hot water, the dichloride types react somewhat more easily, especially at lower temperatures.

Figure 1 illustrates the chemical reaction between a halogen atom of the dye molecule and the hydroxyl group of a cellulose molecule, forming a covalent bond. At the same time a side-reaction with water also takes place. The hydroxyl derivatives thus formed are inactive, ie, they can no longer react with the fiber. However, since the sulfo groups are not involved in the reaction, the inactivated dye retains its original high solubility. Dyestuff reacted with the fiber will be designated *fixed* dye. Dyestuff reacted with the water will

$$R - X + HO - Cell \xrightarrow[heat]{alkali} R - O - Cell + HX$$

$(SO_3H)_n$ $(SO_3H)_n$

*Reaction with cellulose*

$$R - X + H - OH \rightarrow R - OH + HX$$

$(SO_3H)_n$ $(SO_3H)_n$

*Side reaction with water*

**Figure 1**

be called *unfixed* dye. Unfixed dyestuff on the fiber must be removed by rinsing and soaping in order to obtain the benefit of the high wetfastness of the fixed dye.

Various methods may be used to prove that a chemical reaction is taking place between the dyestuff and the fiber. For instance, reactive azo dyes can be stripped, and that portion of the original dyestuff molecule which remains attached to the fiber can be redeveloped. Figure 2 shows a print of Cibacron Brilliant Red 3B and a corresponding schematic formula for reactive mono-azo dyes linked to cellulose. Figure 3 illustrates portions of the original print after stripping with sodium hydrosulfite (white) and after diazotizing with nitrous acid (faintly colored) with the corresponding chemical symbols. After reduction (stripping) the dye molecule is split at the azo group (—N=N—) into two separate components, $R_1$ and $R_2$, each with one amino group. The $R_1$ component is removed from the fiber, since it is water-soluble (sulfo groups). The $R_2$ component, however, remains firmly attached to the fiber. When this component has no color of its own, it is possible to strip a dyeing or print to a white, or to obtain a white discharge print on a ground shade which previously underwent chemical fixation. This is the case in the example of Cibacron Brilliant Red 3B. On the other hand, when $R_2$ has a color of its own, white stripping, or a white discharge is only possible before, but not after chemical fixation. The amino group on $R_2$ can be diazotized (Figure 3) and subsequently coupled with an amine or phenol (Figure 4). Three portions of the original print were stripped white, diazotized and coupled with three developers (Figure 4). In this manner three new chromophors with different shades were again formed on the fiber. Such reactions may serve to identify certain reactive dyes on the fiber.

## FIELDS AND METHODS OF APPLICATION

In the following discussion those reactive dyes which contain only one chlorine atom, ie, Cibacron dyes, will be considered. These dyes are applied on conventional equipment by simple procedures. Pad-dyeing, exhaust-dyeing, and printing methods will be treated separately.

PADDING METHODS———All pad-dyeing methods consist essentially of three separate steps.

1) Mechanical application of the dye by padding with or without subsequent drying.

2) Chemical reaction or fixation which takes place between the dye molecules and the hydroxyl groups of cellulose in presence of alkali and heat.

3) Removal of unfixed (hydrolized) dye by thoroughly rinsing and soaping at the boil.

PADDING———The padding operation offers no difficulty. The small and highly soluble reactive dye molecules have practically no affinity to cellulose in the absence of electrolytes. Therefore, partial exhaustion of the padding liquor does not take place, and tailing (gradual shade change over a certain yardage) is generally eliminated. This holds true even for padders with a large trough (slow renewal of padding liquor), and also where there is a relatively long period of contact between the dip and the nip, ie, between liquor and cloth before squeezing. Hence, unlike many other soluble dyes, reactive dyes are regarded as ideal padding colors. The padding temperature can be as high as desired for optimum wetting and penetration, since the monochloride products will not react with the water even at the boil, provided there is no alkali present. The dyestuff may also be boiled safely to effect rapid and perfect solution.

DRYING———Drying after padding is generally recommended, because better color yield is obtained, and fixation can be more easily controlled. Large yardages have been dried with excellent results on such machinery as hot-flue or nozzle-type dryers, drying cans, clip tenter frames with pre-dryers and pin-tenter frames. However, because of the low substantivity of these dyes, migration and thus faulty dyeing can occur on improperly adjusted drying equipment. The dye tends to migrate in the initial stage of water evaporation. In order to reduce the amount of water to be evaporated, it is advisable to avoid too low an expression on the padding mangle. A pick-up of 80% or lower should be safe. An initially slow drying will greatly reduce the danger of migration, and therefore a low temperature at the front end of the dryer is recommended. This is of particular importance when drying over cans, because, if wet goods are brought in contact with an overheated metal surface, the water on the goods will boil off rather than evaporate slowly and thus cause migration. Also, any slubs protruding from the flat surface of the goods will be pressed onto the hot metal and will dry out rapidly. Dye liquor will migrate through capillary action to these rapidly drying slubs, which will therefore be dyed more heavily, leaving small, lighter-dyed spots (halos) underneath and in the immediate proximity. For these reasons it is essential that the first two sets of cans be kept below 212° F. A similar condition was encountered during one of the earlier trials, when a flue dryer was allowed to overheat before running the material. At the start of the run the temperature of the air was immediately adjusted, but the overheated stainless-steel guide rollers remained very hot for some time, causing a similar effect to that produced by very hot drying cans. When the flue was operated properly during a second run, the shade appeared solid from the start. Yet another cause of migration due to hot metal was observed on an enclosed sectional tenter frame, when, despite a low air temperature in the first section, the clips became overheated in the last section and clip marks on the goods resulted. Upon reducing the temperature in the last section, clip marks were eliminated. It should be noted here that infrared radiation is a good method of pre-drying, since it penetrates the material, thus avoiding surface drying encountered when using other methods involving hot air or drying cans.

**Original red print**

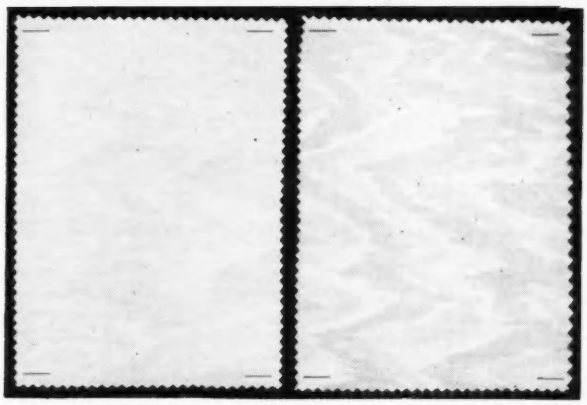
Cibacron Brilliant Red 3B

$$R_1 - N = N - R_2 - O - Cel$$
$$(SO_3H)_n \qquad (SO_3H)_n$$

*Monoazo dye linked to the fiber*

**Figure 2**

**Portions of original red print after stripping and after diazotizing**



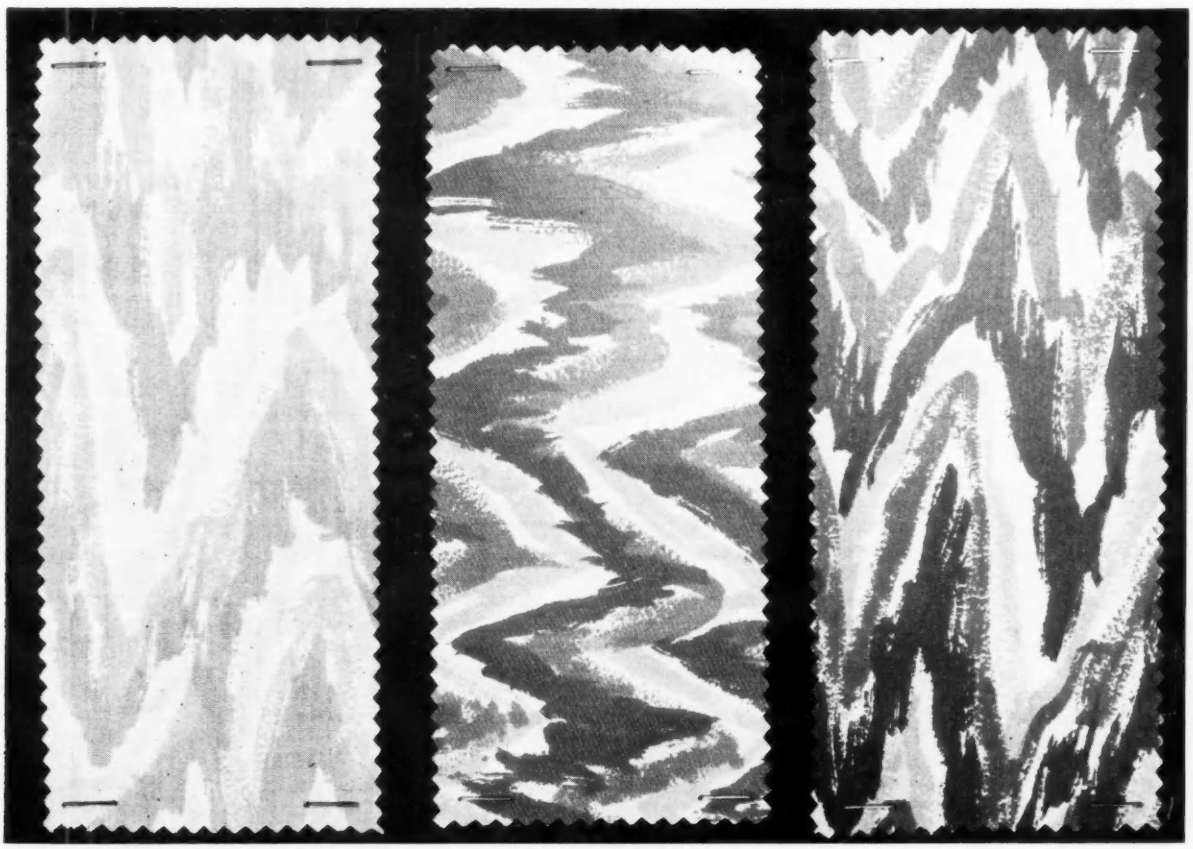
stripping (white) diazotizing (very faintly colored)

$$H_2N - R_2 - O - Cell \qquad N \equiv N - R_2 - O - Cell$$
$$(SO_3H)_n \qquad\qquad Cl\ (SO_3H)_n$$
$$+$$
$$R_1 - NH_2$$
$$(SO_3H)_n$$

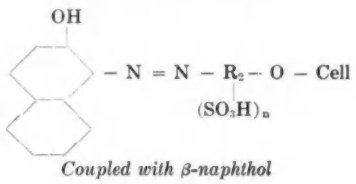
*Stripped with hydro* *Diazotized*

**Figure 3**

**Portions of diazotized sample coupled with three different developers**



3-Methyl-1-phenyl-5-pyrazolone (yellow) Beta Naphthol (orange) Naphthol AS (red)




*Coupled with β-naphthol*

**Figure 4**

The above practical suggestions have been made in order to point out that any difficulties encountered in drying may usually be corrected simply and effectively. It should also be mentioned that equipment suitable for drying other soluble dyes of low affinity, such as naphthols or solubilized vats, is as a rule equally suitable for the drying of reactive dyes.

CHEMICAL REACTION———The chemical reaction which produces fixation of the dyestuff on the fiber can be brought about in various ways. For the practical dyer it is most convenient to consider them from the point of view of equipment.

PAD-JIG METHOD———The dye is padded on the goods without any special additions to the padding liquor. Fixation is accomplished in 30-45 minutes by several passages on the jig at an elevated temperature. The liquor consists of a saturated common salt solution and an alkali, such as trisodium phosphate, the former to prevent or reduce bleeding before the dye is fixed on the fiber, and the latter to effect reaction. Enclosed jigs are recommended, although, when reasonable care is exercised, open jigs also prove successful.

PAD-STEAM———By this method, padding, fixation, and soaping may be carried out in one continuous operation. The solution of the first padder contains the dye and no other chemicals. The liquor in the second padder is kept at room temperature. It is again made up of a saturated salt solution to prevent bleeding and contains caustic soda, a strong alkali, for rapid fixation during a short steaming of 20-60 seconds at 215-225° F. Since the chemical reaction is not a reduction and oxidation as in vat dyeing, oxygen in the air does not interfere, and thus a completely air-free atmosphere is not required. Considerable variation in steaming temperature has little or no effect on the shade. Drying between the first and second padder is required for heavier shades and is advisable for all shades. However, light shades can be produced on equipment which does not provide for intermediate drying, but it is then necessary to ensure adequate pick-up of alkali by keeping the degree of expression in the dye padder as low, and that in the chemical padder as high as possible. The concentration of alkali may also be increased. Furthermore, when entering wet goods into the second padder, it is essential to guard against tailing of the shade caused by dilution of the chemicals in the pad liquor. The second pad box therefore should have a small capacity, and an adequate and constant padding liquor overflow should be maintained. These precautions, of course, also are taken when vat dyes are applied on the pad-steam without intermediate drying.

SINGLE-PAD/STEAMING METHOD———This method is of special interest for the production of ground shades used for discharge or overprinting. The dyestuff and the required alkali for fixation are applied on one padder. After drying, the goods are printed, and on subsequent steaming the ground shade as well as the discharge or overprint colors are fixed simultaneously. The removal of loose dye is accomplished in the print-washing operation. The advantages over direct dyed or diazotized and developed ground shades are apparent in a substantial saving of time and labor, as well as in the attainment of a high wetfastness equaling that of the illuminating dyes, eg, indigoid vats. Besides dyestuff, the pad liquor contains 2.5 to three ozs/gal soda ash and six to seven ozs/gal urea. An addition of one to two ozs/gal sodium m-nitro benzene sulphonate (Albatex BD) prevents "hydro fumes" in the ager from affecting the ground shades and assists in eliminating doctor streaks or facing. Although soda ash is present in the pad liquor, a reaction of the monochloride type of dye with the water has not been observed at a temperature as high as 140° F, which is the recommended maximum under these circumstances.

PAD THERMOFIXATION METHOD———As the name implies, chemical reaction is effected by dry heat. The padding liquor contains the dyestuff, alkali and urea. In this case, soda ash has been found to be the most satisfactory alkali. A relatively large amount of urea, six to 14 oz/gal depending on the depth of shade and type of material, is most beneficial for best color yield.

As mentioned in the single-pad/steaming method the temperature of the dye solution must not be above 140° F when the addition of alkali is made, otherwise the dyestuff may begin to react with the water. The dyestuff and urea are dissolved at the boil, the mixture is then cooled by diluting with cold water, followed by the addition of the dissolved soda ash. Finally the pad liquor is made up to the desired volume with water and the temperature is adjusted to 140° F.

After padding, the goods are dried and then subjected to heat at 285° F-300° F for three to five minutes. The curing time and temperature may vary considerably depending largely on the depth of shade, as well as on the type and construction of the material. In many instances, substantially shorter curing times have been found to produce entirely satisfactory fixation and color yield. The degree of fixation obtained under practical conditions can be compared readily with that attainable at the maximum time and temperature, which for light goods is three minutes at 300° F, and for heavy material, five minutes at 285° F. For this purpose of comparison, a sample of the padded and dried fabric is cured in a laboratory oven and then rinsed and soaped at the boil together with a sample from material which underwent thermofixation on the plant unit.

The pad thermofixation method offers advantages over other methods in that it gives superior color yield and often better coverage of various defects in the material. In some mills it may be a disadvantage, if the goods must be transferred for the heat treatment to a resin-curing unit in the finishing department and then back to the dyehouse for soaping. However, if there is a pigment dyeing range in the mill, it is likely to be suitable for padding, drying and heat fixation in one continuous operation. It may be comprised of a padder, flue dryer and of a series of pressure cans for fixation; or a can pre-dryer may be followed by a hot air-curing unit. An alternative procedure is to dry on cans or on a flue, and to apply the heat treatment on an enclosed 60- or 90-foot frame. Obviously, due to its versatility and its advantages it can be expected that the thermofixation method will be widely used in the application of reactive dyes.

PAD/ROLLER METHOD ——— This method is perhaps of lesser importance, but in the absence of other equipment it can be used. The goods are padded, dried and then run through a series of roller vessels for fixation. Three or four compartments are charged with a saturated common salt solution and with caustic soda to effect fixation during the short immersion time of one or two minutes. The chemical bath is kept at or near the boil. Unfixed dye is removed in subsequent compartments.

Vessels which are constructed to produce turbulence, such as the Williams Unit, tend to remove the dye liquor from the fabric before chemical reaction can take place and are unsuitable for the purpose of fixation. On the other hand they are most efficient for the removal of unfixed dye.

PAD-ROLL METHOD ——— This method requires the use of a "Pad-Roll" dyeing machine (*2*). Although at present there are only a few units in the United States, the method is mentioned because it yields excellent results. The material is padded with the dye liquor containing 2.5 to three oz/gal of soda ash. From the padder the material passes through an infrared heating zone, which raises the temperature of the liquor on the material and of the material itself. The goods are then rolled onto a cylinder in a chamber with controlled temperature and humidity. After padding, the chamber is hermetically sealed and removed to make room for the next batch to be padded and rolled on a cylinder in another chamber. During the fixation time of approximately three hours, the cylinder is slowly rotated inside the chamber. Intermediate drying is eliminated.

REMOVAL OF UNFIXED DYE——Dyestuff which did not react with the hydroxyl groups of the cellulose during fixation, but which reacted with the water or with hydroxyl groups of other chemicals, must be removed from the goods in order to attain the excellent wetfastness associated with reactive dyeings. Since the reactive dyes have a low substantivity, it is possible to remove the unfixed dye by rinsing with warm water and soaping at the boil with a good detergent and a small amount of alkali.

The jig is less efficient in achieving rapid removal of unfixed dyestuff, because of the short liquor-to-goods ratio. Nevertheless it is being used with good results for smaller yardages. The goods are given several passages through hot overflowing water, and in the interest of speeding up production it is advisable to drain and renew the rinse water after each passage. This is followed by one or two separate soaping treatments at the boil and by further rinsing through hot water, until the rinse water remains reasonably clear. The amount of rinsing and soaping depends largely on the depth of shade, light shades requiring about four to six and heavy shades up to twelve ends.

Washing on an open-width soaper is considerably more convenient and more productive, provided at least six separate compartments are available. The first and second compartments are used for rinsing at 140-180° F. A generous overflow will prevent any undue build-up of loose dye. If a hot water feed is not available, cold water is used, but then the steam should be opened to keep the temperature as high as possible. The third, fourth and fifth compartments are charged with 0.25-0.5 oz/gal detergent and 0.25 oz/gal soda ash. The temperature is kept at 200° F by an adequate steam supply. For longer runs and heavier shades it is essential to feed fresh hot soap solution into the compartments from a storage tank, preferably through a spray in front of the squeeze rolls separating the tanks. If there are no feed tanks, it will be necessary to renew the soaping liquor by a water feed and to replenish the chemicals manually at regular intervals. The sixth compartment serves for a final rinse. Deep compartments, or more than six shallow compartments, are required for medium and heavy shades. A well-established soaping process will pay dividends in savings of chemical cost and in maintaining maximum fastness throughout long runs.

Soaping in rope form on the winch or on a continuous unit produces a stronger mechanical action and is thus more effective than soaping in open width. A high output is achieved on the modern low-tension rope washers.

DYEING BY THE EXHAUSTION METHOD———Despite the low affinity of reactive dyes, it is possible to obtain dyeings of surprisingly good color yield from a long bath. The explanation is simple. The very soluble and small reactive dye molecules have a high rate of diffusion into the fiber. Dyeing equilibrium, at which the amount of dye exhausting onto the fiber equals that of dye bleeding into the bath, is reached rapidly. However, upon addition of alkali the dyestuff on the fiber reacts and becomes attached to the cellulose. Since it can no longer bleed back into the bath, the previously existing equilibrium is disturbed, and more unreacted dye will now exhaust onto the fiber and will again become fixed. Theoretically this process would continue until all the dye originally in the system exhausted on and reacted with the cellulose. However, it has not been possible to attain conditions under which the side reaction with water is eliminated. Fortunately the rate at which the reactive dye becomes inactivated by the water is considerably smaller than the rate of diffusion into and reaction within the fiber. It is for the above considerations that the practical processes and results discussed in the following are possible.

The dyeing procedure for the monochloride products from a long bath is simple. The dyestuff is dissolved conveniently by a short boil and the solution is added to the dyebath at 140-160° F. At that temperature, excellent leveling and rapid penetration is assured. After about 10 minutes, common salt is added in two or four portions over a period of 20-30 minutes. The amount of salt should be based on a concentration of five to 14 oz/gal depending on the depth of shade, type of goods, and on the particular machine. Fixation is effected by an addition in two or four portions over 20 minutes of 1.5-2.75 oz/gal trisodium phosphate or soda ash and is completed after approximately 30 minutes at a temperature of 165-175° F. In the special case of Cibacron Turquoise Blue G, the fixation temperature should be close to the boil.

It is interesting to note that the procedure is not critical and may be varied within wide limits to suit the preference of the dyer or to meet special requirements of the equipment. It is possible to add the dye, salt and alkali to a cold bath and then raise the temperature for fixation; or vice versa, to add the dye and chemicals at fixation temperature. Both methods will lead to essentially the same result, although for combination shades the first method is likely to give more easily reproducible results.

There are a number of practical uses for Cibacron dyes applied by the exhaust method. For instance, good results can be obtained on spun viscose raw stock, and even light shades are of excellent uniformity.

Package dyeing is a large field where reactive dyes can be and are being used for combination shades, as well as for fashion shades of a brightness and fastness previously thought impossible. The levelness of such dyeings is very good, affording a solid knitting from package-dyed yarn. "Cross-overs" in mercerized cotton yarns are completely eliminated, even in the case of highly twisted sewing thread. Rayon skein dyeing on cascade machines or cake dyeing on circulating machines is accomplished with ease. Dyeing of knitted fabrics on the winch opens up new perspectives for dress goods and sportswear. The

easily migrating and leveling Cibacron dyes lend themselves to the dyeing of fast and bright shades on viscose carpets. The problem of shading from side to center caused by uneven dyestuff and heat distribution on the very wide machines when using fast-to-light direct dyes, is not met when reactive dyes are used.

PRINTING———Cibacron dyes are especially adaptable to machine and screen printing where they offer new and wonderful possibilities. Printing procedures are simple, the methods of fixation and of the removal of unfixed dye being analogous to those outlined for pad dyeing.

Foremost consideration must be given to the selection of thickeners. Starches, and various types of modified or converted starches, are not suitable in conjunction with reactive dyes, because their molecular structure is related to that of cellulose. An undesirable reaction between the thickener and the dye would cause a loss of color yield and/or impair the otherwise very good wet- and crockfastness properties. However, sodium alginates do not react with these dyestuffs and can be used safely. Alternatives are gum trag and cellulose ethers. Oil-in-water emulsions are being investigated, and it is possible that sharp prints and good color yield will be achieved with this system.

The print pastes are easily prepared by mixing the dye powder with the requisite amount of dry urea, dissolving this mixture in a small amount of hot water and stirring it into the gum. The necessary alkali is added (not above 140° F), and after straining, the printing color is ready for use. Other additions, such as various types of solvents and hygroscopic agents, are unnecessary owing to the good solubility of the reactive dyes. Since the Cibacron dyes do not readily react with the water, even in presence of alkali, printing pastes are stable and printed goods may be stored indefinitely before and after steaming without detriment to shade and fastness. During printing, the colors are visible, permitting close fitting of the pattern; and after printing, rollers, color brushes or screens are easily cleaned with water. The latter is especially appreciated by the busy colorist and printer during strike-off periods.

The fixation of prints made with reactive dyes takes place during steaming in a rapid ager. Steaming time is usually three to four minutes, although it may be extended to 30 minutes without any noticeable change in shade or reduction in color yield. An air-free steam atmosphere is not required. Fixation may also be accomplished with dry heat (thermofixation) of 300° F for five minutes. After fixation, the prints must be rinsed and soaped to remove unfixed dye, according to the methods described for dyeing. Soda ash should not be used in the soaping of printed goods, in order to avoid any staining of white grounds.

Cibacron dyes render unusually bright and fast patterns on cotton, viscose, silk, and chlorinated wool fabrics. They need not always be regarded as a separate range of colors, but can be printed in conjunction with other classes of dyes, such as vats, azoics, solubilized vats, pigments, etc. However, azoic and solubilized vats must then be applied by a neutral steaming method, since acid steaming would, of course, counteract the fixation of the reactive dyes. On the other hand the alkali in the print paste of reactive dyes makes possible the production of resist prints under aniline black, Variamine blue, and solubilized vat dyes, which require an acid condition for development. The material may be padded and then overprinted with reactive dyes, or printed first and subsequently overpadded. The former procedure gives the best results, but the latter is more practical and more easily controlled. Similarly, reactive pad dyeings may be resisted in those areas which are printed with a reducing agent, such as hydrosulfite. White, and colored resists with vat dyes, can thus be obtained.

## FASTNESS PROPERTIES

Fastness properties may be grouped into two categories:

1) Fastness properties which depend on the stability of the chemical linkage. These include water, wash, perspiration fastness, resistance to organic solvents, and crocking fastness. Numerous tests proved that the chemical linkage is very stable even to boiling wash liquors, and therefore these fastness properties are of a high order. It is important that, before dyeing, the material does not contain any impurities, such as residual starch, which may react with the dyestuff. This could well impair the wetfastness or cause poor resistance to wet crocking. In other words, the preparation of the goods is as consequential for a good dyeing as it is for the final fastness. Also the complete removal of unfixed dye in the rinsing and soaping operation is indispensable for optimum wetfastness.

2) Fastness properties which depend on the stability of the chromophore or of the dyestuff molecule proper. These include lightfastness, fastness to chemicals such as chlorine, resistance to light after resin finishing, and others. This group of fastnes properties is generally better than would normally be expected of dyeings of comparable brightness on cellulose. For instance, Cibacron Brilliant Yellow 3G has a considerably superior lightfastness to anthraquinone vat yellow GC (*CI* Vat Yellow 2). Cibacron Brilliant Red 3B, apart from its higher lightfastness, has a marked degree of resistance towards chlorine as well as acid, compared with its closest counterpart, azo-thiazole (*CI* Direct Red 9).

Fastness to thermosetting resin finishes has been the subject of extensive investigations. The reactive dyes show little shade change regardless of the type of resin and catalyst used, and regardless of whether or not the material is washed after curing. This is of great convenience in shade matching and also in those cases where one dye lot must be finished with different resin combinations and yet must conform to one standard shade. Nevertheless, when exact shade matching is required, it is advisable to make a preliminary resin test. It is also a good practice to keep an unfinished sample to be used as a dyehouse standard in the event of repeat orders.

The effect of resin finishes on the lightfastness of reactive dyeings depends on the type of resin and catalyst. Methylolurea resins with magnesiumchloride as catalyst have no influence on the lightfastness of Cibacron dyeings. On the other hand, cyclic ethylene urea type resins, known to impair the lightfastness even of many vat dyes, reduce the resistance to light of the brightest reactive dyes, viz, Cibacron Brilliant Orange G, Scarlet 2G, Brilliant Red 3B, and Turquoise Blue G, to a considerable extent. Melamine resins behave only slightly better than cyclic urea resins. The less bright members of the Cibacron range, viz, Yellow R, Rubine R and Blue 3G, show a remarkable resistance both to cyclic urea and melamine resins.

A number of modified urea-formaldehyde resins, which can be used for "wash-and-wear" finishes, have no or very little effect on lightfastness, even of the brightest Cibacron dyes. The catalyst should be an organic amine hydrochloride type, or preferably magnesium chloride. Since chlorine should be avoided when washing goods finished with such resins (chlo-

rine retention), the fact that most reactive dyes are not stable to chlorine is of lesser importance. Therefore, "wash-and-wear" cotton dress goods dyed and printed in brilliant colors with Cibacron dyes and finished with a modified urea-formaldehyde resin, will have excellent all-round fastness, except to chlorine bleaches.

The fastness properties of the existing Cibacron dyes satisfy all but the most demanding or very special consumer requirements. No doubt dyestuff manufacturers will succeed eventually in extending the range of reactive dyes with still better products.

## CONCLUSION

Reactive dyes constitute one of the most unusual and extraordinary innovations in textile dyeing in many years. Their ease and versatility of application has been proven in numerous practical trials. Because of the unique combination of brilliance of shade with very good all-round fastness, they will meet with the ever-increasing consumer demands for more attractive materials with better serviceability.

After their short period of introduction, Cibacron dyes have not only stimulated a great deal of interest and enthusiasm, but already they are being used for practical production in dyeing, as well as in printing, by a number of larger and smaller mills throughout the United States.

Credit is due to the dyeing and printing industries in conducting many initial large-scale experiments in a spirit of enterprise and foresight, which is responsible for all progress.

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See also *Ciba Rev* No. 120, June 1957, "Special Number on Cibacron Dyes".

**Delaware Valley Section Ladies Night**
**April 12, 1958**
**Kugler's Restaurant, Philadelphia, Pa**

**(L to r): Mrs Speakman; Frederick V Traut, Globe Dye Works Co; William S Sollenberger, American Viscose Corp, chairman; Mrs Gino; Paul L Speakman, E I duPont de Nemours & Co, Inc; Mrs Traut; John Gino, Joseph Bancroft & Sons**

**(L to r): Myron D Reeser, Howes Publishing Co, Inc; Mrs Reeser; William H Bertolet, Laurel Soap Mfg Co; Mrs Bertolet; Edward C Diehl, past chairman; Mrs Diehl**

**(L to r): Mrs Bond; Boyce C Bond, Metro-Atlantic Inc; Mrs Wunsch; George G Wunsch, North American Lace Co, publicity chairman; Mrs Empting; Ernst Empting, Verona Dyestuffs, secretary**

**Part of the group of 250 members and guests attending the Delaware Valley Section's 1958 Ladies Night Meeting, which was highlighted by "Las Vegas" party, dinner and dancing**

36th Annual Convention———

# SOME CONSIDERATIONS OF THE AZOIC INSOLUBLE DYES IN PRINTING*

**DOREL MARIAN**

*Compagnie Francaise des Matieres Colorantes*
*Paris, France*

A brief history of the evolution of this problem is presented starting with the beta-naphthol up to the mixtures of naphthols and specially stabilized salts. A chemical explanation of each step is given.

A practical part of the paper is concerned with the printing problems of azoic dyes, alone and associated with other classes of colors.

The influence of steam (neutral or acid) and the speed of the treatment is explained. Other means of fixation for these dyes are presented.

Finally, economical considerations are shown by graphics for fixing the interesting limits in the use of azoic dyes in printing.

## HISTORICAL

ONCE upon a time, and in our era (within a 50- to 60-year span, we are entitled to use this figure of speech) chemists thought to manufacture dyes on the textile fiber itself. This idea was the one which led Koechlin and Ulrich in Germany and Holliday in England to the first practical result: the para red.

So were born the dyes, called at the start "ice colors."

A soaking of the fabric in beta-naphthol, followed by drying and subsequent development in an acetic bath of the paranitraniline diazo, gave a red shade. (Figure 1).

To obtain other shades, the dyer had but to change the diazo. So, for instance, beta-naphthol coupled with meta-nitraniline gave orange; with naphtilamine, bordeaux; and with dianisidine, blue.

The need for all-around fastness and brightness of the shade, and difficulty in application obliged the dye chemists to further research.

The main idea, that is, the coupling of two products on the fiber, was good and had to be followed, but it was necessary to find a suitable range of constituents.

Chronologically, the next step was the one of the Naphthol AS series. Most of these are the arylides of 3:2 hydroxynaphthoic acid, which results from the condensation of beta-oxy-naphthoic acid with an amine.

To increase the "palette" of shades and to achieve better fastness, other products, quite different from those mentioned above, had to be adopted. (Figure 2).

One advantage of the Naphthol AS series is that they have a certain substantivity stemming from their chemical constitution for cellulosic fibers and, hence, result in faster dyeing.

The other coupling element is the "base." Here too, the range is rather large. Generally, they are arylamines, without any solubilizing group.

So that the dyer would be spared the trouble of diazotation, bases were diazotized and stabilized and sold under the name of "salts." They are the result of the addition of $ZnCl_2$, fluoboric acid ($BF_4H$), naphthalene-disulfonic acid, etc, to the diazotized base.

If the dyer was satisfied with the result of the long research work in naphthols, fast color salts and bases, it was not so with the printer.

Should we say: fortunately or unfortunately?

Fortunately, I think, because this attitude obliged the research chemist to a new and laborious work. As beneficiaries of his successful achievement, we should express to him our thankfulness.

The printer wanted—in view of economical considerations — ready-made mixtures of the two agents; that is, the naphthol and the diazo, but

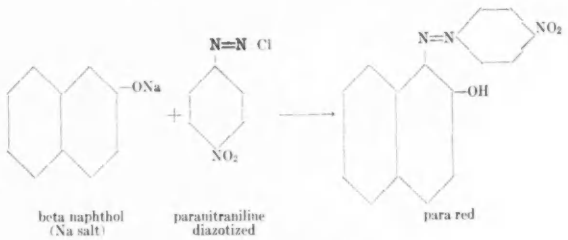
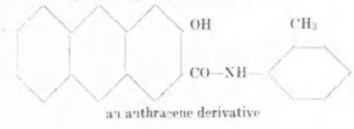



**Figure 1**

*Azoic Coupling Component 5 (CI 37610)*

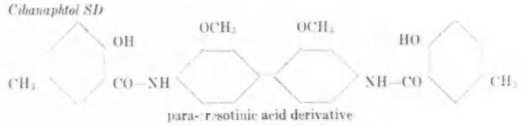
bis acetoacetyl tolidine derivative

*Azoic Coupling Component 36 (CI 37585)*




an anthracene derivative

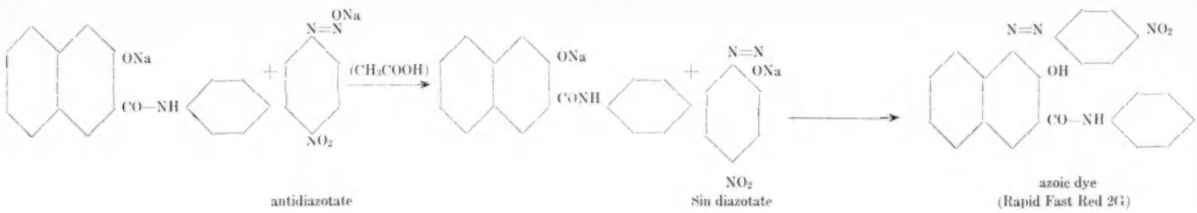
*Cibanaphtol SD*




para-cresotinic acid derivative

**Figure 2**

*Presented November 16, 1957 during the 36th Annual Convention of AATCC at Boston, Mass.




antidiazotate — Sin diazotate — azoic dye (Rapid Fast Red 2G)

**Figure 3**

the coupling should take place only after printing.

There were three possible approaches to this problem:

a) to transform the diazo into an antidiazotate,

b) to transform the diazo into a diazoamine,

c) to transform the diazo into a diazosulfonate.

All possibilities in this field were explored and some led to very interesting results.

A) TRANSFORMATION OF THE DIAZO INTO AN ANTIDIAZOTATE ——The stability of the antidiazotates is connected with the basic character of the amine. Satisfactory results can only be achieved with the light basic amines, such as chloronitranilines, nitrotoluidines, dichloranilines, etc. The first range of such dyes was sold in 1915 under the name of Rapid Fast. An example of the chemical reaction in such a case is shown in Figure 3.

The real reaction is induced either by neutral aging followed by an acid bath, or by acid steaming, or by hanging in air and then acid development.

The disadvantages of the Rapid Fast colors are threefold: the stability of the print paste is limited to a few days, the shades are rather dull, and all-around fastness is insufficient.

An advantage of the Rapid Fast colors is that they can be used alongside vat dyes.

Something had to be done to get better results and so we arrived at the next step, ie, insoluble azo dyes which are mixtures of a naphthol and diazoamine, eg, Rapidogens.

B) TRANSFORMATION OF THE DIAZO INTO A DIAZOAMINE ——Here too, some explanations are necessary to understand the limits imposed on the huge range of diazoamines. In order to be suitable for the mixture with naphthols, diazoamines have to:

a) be soluble in water,

b) regenerate easily the diazo in acid medium,

c) have the general constitution: $R - N = N - NH - R_1$, and

d) not show any tendency to transposition.

This is why the generally used stabilizing agents are those shown in Figure 4.

Insoluble azo dyes of the Rapidogen type require an acid treatment for their development. (Figure 5).

The handicap of this range is the impossibility of printing them alongside vat dyes, unless a double aging is practiced.

Replacement of the acid aging by an acid-producing agent in neutral steam was then tried. Esters and salts of organic and mineral acids were recommended but shortly abandoned, and a developer containing a volatile amine, such as diethylaminoethanol, was adopted instead.

This makes it possible to neutral age, because the amine is removed and the acidity of the hydroxy group of the coupling component is sufficient to develop the insoluble azo dye.

But even with this method, difficulties are not completely eliminated. Often, the results are irregular and there are shade changes when insoluble azos are used alongside oxidation blacks on account of the alkaline vapors which are released.

Economic factors also limited the use of a developer containing a volatile amine, the price of which is rather high.

Research was therefore continued, and we arrived at the third step.

C) TRANSFORMATION OF THE DIAZO INTO A DIAZOSULFONATE ——Certain diazosulfonates, such as the Rapidazols, which can be developed only in neutral steam, did not meet with great success because of their limited range.

Others, such as the Photo Rapids, manufactured by St-Denis, have to be exposed to sunlight, mercury vapor lamps, or electric arcs, and are therefore of little interest to the textile printer.

Another group, known as the Neocottons, then appeared on the market. They contain solubilizing groups regenerated in the fiber by treatment with barium hydroxide and sodium chloride.

With all these products, we are in

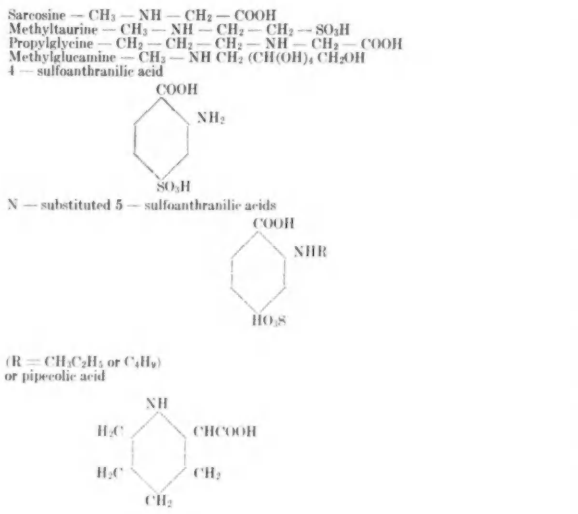



**Figure 4**

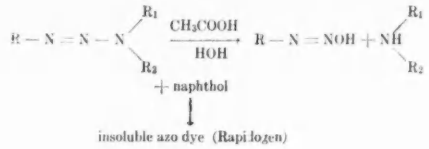



Figure 5

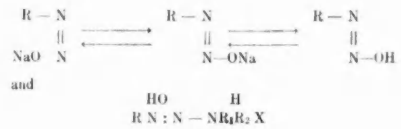



Figure 6

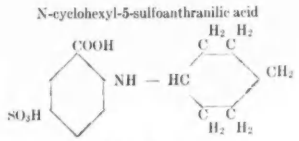



Figure 7

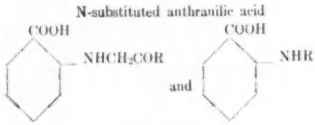



Figure 8

sight of our goal, but have not actually reached it.

NEW APPROACH——A new approach was sought between the hydrolysis in an alkaline media representing the solution reached with the so-called Rapid Fast, and hydrolysis in acid steam, represented by the insoluble azo dyes of the Rapidogen type (Figure 6).

After many years of work, partial success was achieved by Kuhlmann, with the use of N-cyclohexyl-5-sulfoanthranilic acid (Figure 7), and the IG, with another solution.

However, it was felt that these results were not yet good enough.

As a result, M Petitcolas, manager of Francolor's azoic dyes research department, focused his efforts on the N-substituted anthranilic acids (Figure 8), and from this the Neutrogenes (neutral-aging azoic colors) were born in 1950.

The stabilizing agents too, had to be very carefully chosen so as to obtain dyes of good stability, of easy application, and of completely reliable development in neutral steam.

O-carboxyphenylglycine; its 3-, 4-, and 5-chloro, dichloro and methoxy derivatives; esters and amides of these acids; N-alkoxyanthranilic acids and their derivatives substituted in the benzene ring, etc, were found to be satisfactory.

Practical work showed, nevertheless, that the shades of the Neutrogenes were not bright enough under some of the difficult conditions they were used and colorists asked for something even better. The team of chemists succeeded in meeting their demands by altering some substitutes in the stabilized derivatives of the anthranilic acid. These products are the Neutrogene VA'S.

Here, although we could have considered the problem as entirely solved, some coloristic difficulties were yet confronting us. Some shades could not be obtained by mixtures of elements. Combining azoic dyes was possible within certain limits, but uniformity of results from one lot to the other was not always perfect. Fastness properties of these combination shades could not be recorded in pattern cards.

M Petitcolas found the solution with the Neutrosels, patented stabilized salts of anthranilic acid derivatives which may be mixed with any naphthol when preparing the paste. The stabilizing agents are, in this case, quite different from those used in the fast color salts we spoke of previously. The Neutrosels are free of $ZnCl_2$ or any similar product.

The printing paste is stable for several weeks and the coupling is effected by neutral or acid aging. A wide range of shades is obtainable with perfect repeats and regularity of results and all fastness properties are recorded in the pattern card.

That is the point we reached in 1956!

Up to this moment, I have concentrated on purely chemical problems for two reasons:

1) to show the successful result of collaboration between the application and the research chemist.
2) to understand better the technical difficulties which can arise in a textile mill.

Now, I would like to discuss with you the practical part, the application of the azoic insoluble dyes in printing.

## APPLICATION

As mentioned before, the dyer has obtained full satisfaction with the naphthols, fast color bases and salts. Even the most up-to-date dyeing methods, eg, Williams Unit, Pad-Steam, etc, give perfect results with these dyestuffs.

For the printer, the problem, as we have seen, was not the same.

The range of azoic dyes is large and a choice has to be made. Every mill, small or large, has its own peculiarities. The colorist has to make a judicious selection of the dyes, and the job is not easy. This is why we should consider the advantages and handicaps of each group.

It is clear that padding with naphthol and printing with fast salts is the most simple and economic way, for the roller printer at least. The screen printer cannot use this method for technical reasons.

Rapid fast dyes are helpful, especially to the screen printers, but as we know, the results are not always uniform, the stability of the printing paste is of short duration, and special development conditions are required. In Europe, this range, for all practical purposes, has been abandoned.

Insoluble azo colors of the Rapidogen type mean a real improvement for all printers, although they do not satisfy all requirements:

1) Acid aging is necessary—unless we use a developer containing a volatile amine, which often causes eczema.
2) Bleeding on white grounds due to excess unfixed dye is common, and consequently, crocking results.
3) On screen-printed goods, report limits are visible.
4) Doctor streaks are a regular accident.
5) There is limited possibility of association to other ranges of dyes, especially vat dyes.

Another drawback for some of you American colorists so interested in high-speed production (one could even say that this is your hobby) is that insoluble azo dyes of the Rapi-

dogen type require, even by acid aging, a rather long time for coupling. In the United States, the Riegel flash acid aging method requires dyes which can be fixed in a few seconds. The majority of the standard insoluble azo dyes of the Rapidogen type require something like three minutes acid aging, so that they are not suitable for use by this method. The list of obstacles and difficulties presented by the insoluble azo dyes of the Rapidogen type is rather long and we know what that means in a printing plant. In spite of this, they are still used on a large scale, on account of their bright, vivid shades and satisfactory fastness.

Have the Neutrogenes brought any help to the colorist? We can truthfully and firmly say: Yes, they have! With these dyes, almost all of the drawbacks mentioned above are eliminated.

First of all, Neutrogenes retain and even surpass the advantages of insoluble azo dyes of the Rapidogen type as concerns brightness, vividness, uniformity of shades on cotton, staple fiber rayon and the possibility of printing them on acetate, wool and silk.

Secondly, they are not very sensitive to reducing agents, as for instance, sodium sulfoxylateformaldehyde, thiodiglycol, etc. This quality is very important, because of the possibility of printing them alongside vat dyes. In some cases, they can even replace this type of colors. For instance, some yellow brands have excellent lightfastness (160-320 hrs). This makes them suitable for upholstery, particularly as there is no possibility of tendering. When working with certain types of blankets and washers, eg, Darex, some vat dyes, especially the Indigoid types, cause serious difficulties. Their replacement by a suitable Neutrogene easily solves this problem.

Thirdly, the influence of the caustic soda present in the printing paste is by far less important than with other dyes of the same class. A very important advantage is the total absence of doctor streaks in roll-printing.

In screen printing, it becomes practically impossible to see the report limits. Neutrogenes have remarkable leveling properties.

It is interesting to note that, with them, we may easily print wet on wet and as a consequence, use them on screen-printing machines, such as Buser, Stork, Teximpex, Langseth, etc.

A further important advantage is the elimination of bleeding on white grounds, especially when the printed goods are washed in a bath containing condensation products of alkylphenols with ethylene oxide.

Association with almost all other types of dyes is possible. Care has to be taken only as to the order in which the various colors are printed. With vat dyes or sulfur blacks, Neutrogenes have to be printed last. Otherwise, they are generally printed first.

Interesting shades may be obtained by mixing these dyes with direct or soluble vat type colors by the nitrite process.

Conversion effects of great interest to the colorist are also possible.

Reserves under oxidation blacks with perfect brightness of shade can be achieved with the Neutrogenes. Uniformly clean shades are obtained with them.

It is not my intention to discuss in detail the printing recipes of these dyes, nor the influence of each constituent, but what should be mentioned especially are the developing methods available. Neutrogenes may be developed by short (three minutes) neutral aging with full yield. Standard acid aging is possible also. An interesting point is that they can be developed by the flash acid aging method. As a matter of fact, Neutrogenes are the only azoics which can be fully fixed by this method within 10 seconds.

When printed alongside oil-in-water or water-in-oil pigments, Neutrogenes are developed first by a short aging. Last, but not least, these dyes can even be fixed by passage through an acid-containing bath.

When sodium alginate is used as a thickener, perfect penetration is achieved. Many European mills use the Neutrogenes for printing flags.

The stability of the printing pastes is of about two to three weeks, without any loss of brightness or of strength.

The Neutrosels present the same range of qualities as the Neutrogenes.

Experience has shown that the colorist now has the type of azoic dyes he has been looking for.

The technical factors are not the only ones which make a range of dyes acceptable; the economic factor is very important too. The price of a product can either open large perspectives, or make its use prohibitive. Azoic dyes are now used on a large scale, because, examined under the economic aspect, they are also very interesting.

We have seen already that the Neutrogene types can, at times, take the place of vat colors for technical

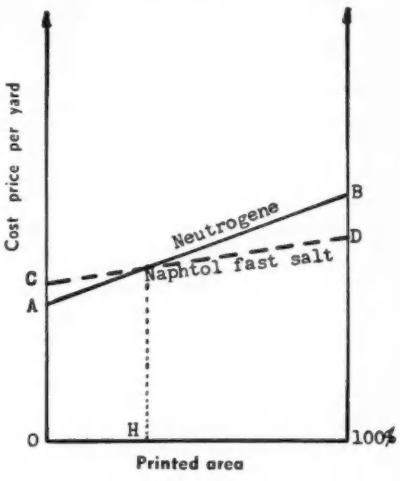



**Figure 9**

**Cost price curve obtained with naphthol fast salt comination (CD) and with Neutrogene (AB)**

reasons; namely, absence of tendering and elimination of attack on print blankets and washers. But, vat dyes, especially the pinks, are replaced by these azoic dyes for economic reasons too. The cost price of the printing paste can be reduced by about 50%, as in the case of Neutrogene Light Red STRVA used instead of a vat pink.

The all-around fastness is the same; for instance, lightfastness of this azoic dye, in very pale shades, is 20-40 hours.

While many such cases are clear, there are nevertheless moments when the colorist does not know whether to use one or an other type of colors (all technical considerations having been set aside); and often, even among the same types, as the azoics, for instance, he does not know which group is preferable. Graphics may help us to see clear, and will help the colorist in his choice.

First we must know all our fixed costs, such as salaries, depreciation of machinery, fuel, overhead, etc, which may vary for each company and even for each department. An interpretation of these costs, in relation to production, gives us the parameter.

It is clear that the cost price depends upon the printed area. Figure 9 shows the cost price curves for the same shade, obtained once with naphthol fast salt combination (CD) and once with Neutrogene (AB).

Distances OA and OC represent "parameter," which is different in each case. The figure shows that, as long as the printed area represents

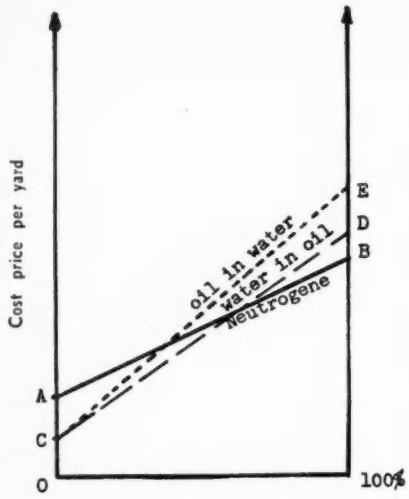



**Figure 10**

**Cost price curve obtained by pigments, oil-in-water, water-in-oil, versus Neutrogene**

only OH% of cover, it is more economic to use Neutrogene-type colors; from OH% up to 100%, the naphthol fast salt combination becomes more interesting.

In the case of a red shade printed with pigments, the graphic looks like Figure 10. OA and OC are parameters. It becomes clear that pigment printing is usually limited to small cover (up to 15%), the reason being the very high price of high-quality fast red pigments.

In both cases, we considered one-color prints. For polychromic printing, the figures look more complicated, but each curve keeps its basic aspect.

Figures 9 and 10, of course, represent cost in a European mill.

Experience has shown that azoic dyes, and particularly those of the Neutrogene type are, from a technical and economical standpoint, interesting in the following shades: yellow, orange, scarlet, red, bordeaux and navy blue.

They do a good job at a moderate cost! Could we ask for more?

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36th Annual Convention ———

# AUTOMATION WITH PROCESS INSTRUMENTS*

W H RIDLEY

*Manager, Textile Industries Div*
*The Foxboro Company*
*Foxboro, Mass*

**Company directors are vitally interested in automation, and always have been. Modern process instruments represent automation in the best sense of the word. There is, today, a great variety of new instrument automation to aid the textile industries in doing a better and more economical job. However, actual or operating management and their staffs do not always have the time, inclination, or the money to give these new tools proper evaluation.**

**As a result, the average mill uses only about one-third as much automation as it should. The success of this current one-third is hindered by the lack of proper maintenance, and by the lack of interest on the part of the operating personnel and their supervisors. This despite the fact that investments in instrument automation result in returns of improved quality and increased efficiency that are phenomenal!**

**Instrument automation is frequently overlooked or kept to a bare minimum when a mill is considering new machinery. This is not so in other industries. In fact, automation is so important that it is considered separately from the machinery. The success of some of the newer textile processes depends completely on automation of the latest type.**

**What can be done to help improve this situation? The following suggestions outline the major steps which should be taken.**

1) **Recognize the importance of industrial instruments by removing them from the "gadget" classification.**
2) **Take from earnings each year *before* dividends, a budgeted amount to improve efficiency through instrumentation.**
3) **Place responsibility in one qualified engineer to check and approve *all* instrument requisitions.**
4) **Analyze carefully all instrument details which are included with new machinery specifications.**
5) **Keep records of increased efficiency to substantiate the continuing automation program.**
6) **Provide for proper maintenance and preventive maintenance.**
7) **Make sure that, once installed, the instruments are properly operated and fully utilized.**
8) **Include in estimate of total installed cost instrument training for operating personnel.**

## INTRODUCTION

TEXTILE company directors have a vital stake in automation. They know it as a new term applied to mechanized production which, appropriately enough, had its start nearly 200 years ago when Samuel Slater applied machinery to textile processing.

Yet today's new phase—the automation phase—of the industrial revolution has even more reason to excite textile interest than its predecessor, accelerated as it is by the availability of many new and improved process instruments. The way is now clearly here to realize fully the benefits which automatic practices and procedures can bring.

Directors can visualize mills made more efficient as the result of automation. They can see improved quality, more uniform quality. All with better working conditions for mill personnel, lower costs, and greater rewards for all. The immediate effect is that machines, power, chemicals and fibers are used more economically and the tedious, dangerous jobs are made easier and safer.

Why, then, are mills not more thoroughly "automated"? Because mill management and operational staffs seldom have time available to evaluate instrumentation properly—or money available to act on the data. A lesser reason in modern mills is the reluctance to change long-established operating procedures.

For these reasons, it is not surprising that the textile industry lags far behind other industries in adopting new instruments. In this Association alone, there are many members who have discovered and tried to apply new processing techniques only to have them retarded in the development stage for want of instruments. Requests for them were denied. Even on the simpler applications—the seemingly basic instrument needs—there has been great difficulty because of the tendency to cling to the old established manual methods. As to complete and permanent accentance of the automation approach, this is more difficult still.

The problem is akin to that faced by the automobile manufacturers in introducing power steering. In the minds of many, this was a gadget, a nonnecessity. Some even thought it was dangerous. Few took the time and trouble to investigate it. Those who did were enthusiastic in their support. Word spread, to the point where today power steering is a necessity for buses and trucks and widely accepted as an operating aid by the motoring public.

The same applies to badly needed process instruments. Where there is lack of knowledge of instrument advantages, the "gadget" tag is unfortunately used. Nothing could be further from fact.

True, there was some justification in the early days of instruments for withholding full acceptance. That was before instruments were designed to cope with the severe operating conditions prevalent in, say, the dyehouse or the bleach room. Today, with stainless metals and plastics put to use, and with instruments designed more from the standpoint of their ultimate applications, there is every reason to take full advantage of instrumentation.

It is not uncommon to find dyehouse instrumentation installed five years ago and still operating with the same efficiency as a new installation. Such performance is essential because of the extreme care needed in dyebath and wet-processing operations, particularly with the modern fibers. Experience has shown that successful dyeing in this field would be virtually impossible without the use of automation.

It is beyond the scope of this paper to present proof of the benefits obtained from the many different wet-processing applications of instruments. However, typical instruments will be discussed and specific advantages detailed to form a base for further evaluation by mill management. Finally, a list of practical suggestions will be offered as an aid to process people in acquiring needed instrumentation and assuring its successful installation and operation.

*Presented November 16, 1957 during the 36th Annual Convention at the Hotel Statler, Boston, Mass.

## APPLICATIONS

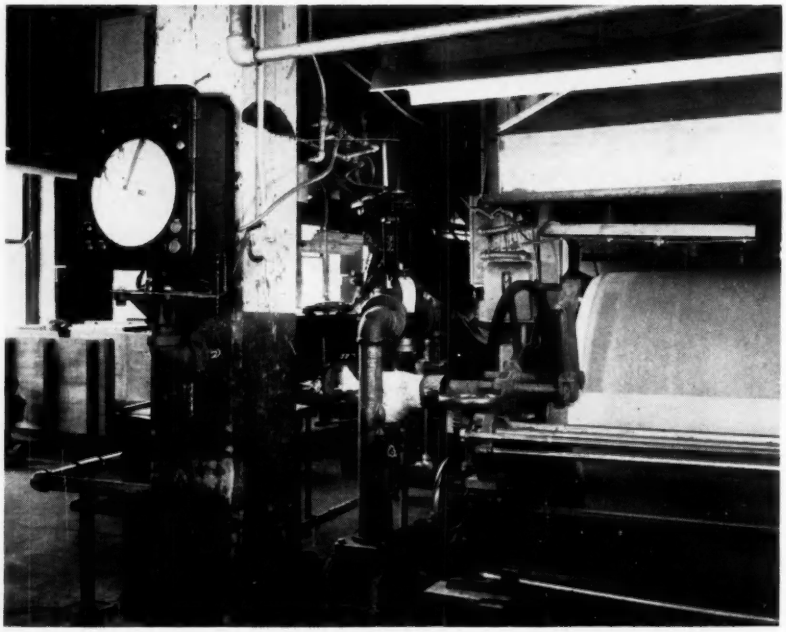
REMOTE CONTROL VALVES——One of the simplest, yet most beneficial instrument applications is tne remote control of valves which govern the feeding of materials to a machine or a process.

Here the example of power steering is again appropriate. The operator of a car equipped with such a steering aid can be compared to the operator of a wet-processing machine equipped with remote control of chemical feed lines. The car operator can park in close quarters with a speed and ease which would be impossible in a car with straight mechanical steering linkage. The machine operator, similarly, has the job of keeping his machine "steered" toward a minimum of down time and consumption of water and chemicals. This calls for quick action when the machine stops. It is necessary to shut off the flow of materials and turn them on again more quickly than hand-valve operation will permit.

His "power steering" is a knob which he turns, thereby positioning a pressure reducing valve which supplies compressed air to a pneumatically operated valve. By use of this knob and guided by an air-pressure gauge, both of which are mounted on a small panel next to the machine, the operator can remotely set up the correct valve opening. Also on the panel is an air switch operated by a small lever, which will position the feed valve to the opening allowed by the pressure reducing valve or fully close it. Another position of the lever will put the machine on "automatic" so that an electric solenoid valve cut into the motor starter circuit will automatically open and close the valve with the starting and stopping of the machine.

Immediate and concrete benefits are realized when, for example, this simple system is applied to a continuous cloth washer. Allowing 10% down time for tangles and rethreading, the hot water saved by a "power-steered" shutoff pays for the fully installed instrument in three months, figuring that hot water was previously wasted at the rate of 200 gpm and based on a two-shift operation. Such obvious savings are in addition to eliminating the waste of soaps and detergents, reducing down time, and making the operator's job easier by cutting the frequency of opening and closing a three-inch hand valve.

A further ramification, which may some day be available, will permit automatic control of the hot water valve based on the cleanliness of the final rinse water.



**Complete automatic control system for semidecating machine in yoke-mounted rectangular recorder-controller case.**

PNEUMATIC LOADING OF SQUEEZE ROLLS——More difficult to assess are the cost savings derived from pneumatic loading of squeeze rolls, despite the fact that this application is now about 20 years old.

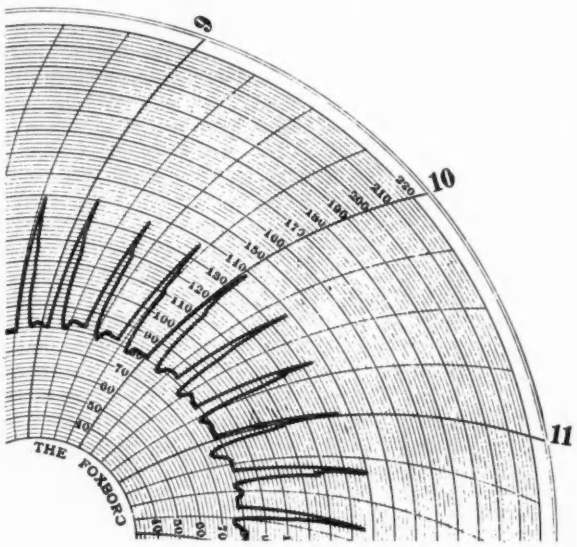
The loading is accomplished by compressed air fed through a regulator to cylinder operators which, in turn, apply pressure to the rolls. The results are more uniform extraction of moisture, more precise control, longer life for roll coverings, automatic roll lifting when machine is not in use, rapid lift of calender rolls to skip seams, and less tedious work for the operator.

While dollar savings are substantial, they are more apt to be long range. Roll-covering firms are the best source of such information and they enthusiastically recommend pneumatic over weight- or spring-loaded rolls. Some roll coverings will flat in a short time if pressure is left on while the rolls are not in motion. Pneumatic loading, with its automatic lift, avoids this. Mill records show that rolls rebuilt with the help of the machinery maker to incorporate pneumatic loading have lasted two years without regrinding, compared with every three months when less-efficient loading methods were used.

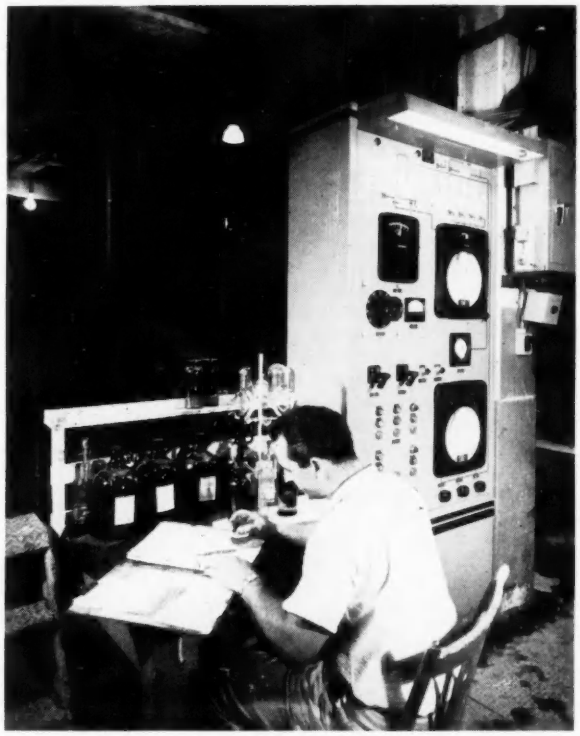
REDOX MEASUREMENT——Automatic make-up of sodium hypochlorite in the mill is another instrument application which has proven itself. It was originally sponsored by Olin-Mathieson's Technical Service when Redox (oxidation-reduction potential) measurement became available in industrial instruments. Using a control system based on the Redox measurement, caustic, water and chlorine can be blended continuously to provide a ready source of fresh bleach solution. Only enough storage capacity need be provided to take care of maximum process demands. If the process using sodium hypochlorite stops, make-up stops immediately without any action on the operator's part.

Advantages are readily apparent. Less storage capacity and space are needed. An area only 12 by 15 feet will accommodate production of one to 1.5 gpm of 25 gpl of chlorine, including the storage tanks. Bleach is made up to the exact strength needed. No extra chemicals need be bought to keep the bleach stable; it's used in the process within minutes after make-up. Bleach by this method costs less per unit than the delivered commercial hypochlorite. Adding to these savings and those derived from reduced handling costs, some mills use recovered caustics from the mercerizer in place of commercial caustic.

Redox measurement proves itself in still another application, detecting the reducing power of a chemical bath as an aid to vat color reduction with sodium hydrosulfite. This measurement was originally introduced by General Dyestuff Co as the




Actual production record of steaming and vacuum cycle for semidecating machine. Note uniformity of treatment for each piece of cloth.



Control cabinet for peroxide section of continuous bleaching range contains graphic display of process equipment.

"Marhen Process". Some mills will not run colors such as blue without a continuous Redox measurement as a guide, particularly on continuous cloth dyeing machines.

Redox is more valuable as a guide than as a basis for automatic control of hydrosulfite addition. From it, the operator can be sure he has sufficient reduction to keep the colors properly dissolved. Automatic control is difficult because the break point in the curve of reduction potential versus concentration of hydro is very sharp to the leuco point where the dye starts to precipitate.

Studies are now in progress to determine the possibilities of control if the critical portion of the potential/hydro concentration curve is expanded. By making the span of the Redox instrument 200 mv instead of the normal 600 mv, it is hoped that the smaller mv change which can be detected will make possible automatic correction by regulation of the hydrosulfite.

Control of caustic concentration in the bath shows similar promise. Excellent correlation between percent caustic concentration and a conductivity measurement of the bath has been achieved. There is good reason to predict that the measurement of conductivity and Redox may one day be the basis for automatic control of liquid caustic and hydro addition.

In the meantime, the Redox guide has improved color yield dramatically. It has made possible a uniform shading of color for entire sets. On jig dyeing, more exact end-to-end shading, less chemicals, and fewer runs have been vouched for. The hydro savings in some plants were spectacular. One mill running three shifts on a continuous range saved $1,000 per week in hydro by means of the Redox measurement.

MEASUREMENT OF CAUSTIC SATURATING BATH———No less important an application for instruments involves the caustic saturating bath at the entering end of a mercerizer. Bath strength is critical and must not vary if good continuous mercerizing is to be obtained. Nor can improper saturation be corrected by a rerun. The mercerizing treatment is permanent.

Since the caustic saturator bath contains only caustic and water, its strength can be measured in specific gravity units by a hand hydrometer. However, a differential pressure meter connected to bubble tubes and a reference chamber will record the specific gravity measurement continuously, eliminating the need for manual checks. Furthermore, it will automatically add stronger caustic as needed to maintain the desired strength of the bath. If the bath is circulated through cooling coils, an automatic temperature controller is needed. If the cloth is entering the saturator dry, level control of water addition is needed to compensate for solution pickup.

How does this instrumentation result in better mercerizing? For one thing, it keeps caustic strength eight to ten times closer to desired value than is possible manually. The result is a better degree of mercerizing, greater freedom for the operator, whose main concern is keeping his machine running, and a considerable saving in caustic. For instance, one mill using a machine averaging 80 yards a minute of four-yard cloth saved nearly $600 in four months, compared with a similar period on manual control.

Recently, the Technical Service Department of one of the chemical companies has been advocating closer control of the weak caustic on the wet tenter. The instrumentation—a conductivity control system—is available and is the same as is now being successfully used on the caustic saturator for prescouring in a continuous peroxide bleaching range.

CONTROL OF TEMPERATURE———Package and beam dyeing have taken on new significance with the advent of synthetic fibers which require high temperature dyeing. Con-

trol of the temperature in this operation is so well developed that a wide variety of time schedule instruments is available.

CONTROL OF DYE LIQUOR FLOW———Control of dye liquor flow, however, has been more difficult. One successful solution has been the use of elbow pipe taps and a differential pressure transmitter as a source of flow measurement. The flow controller then provides the gallons per minute per pound of yarn recommended by the dyestuff manufacturer.

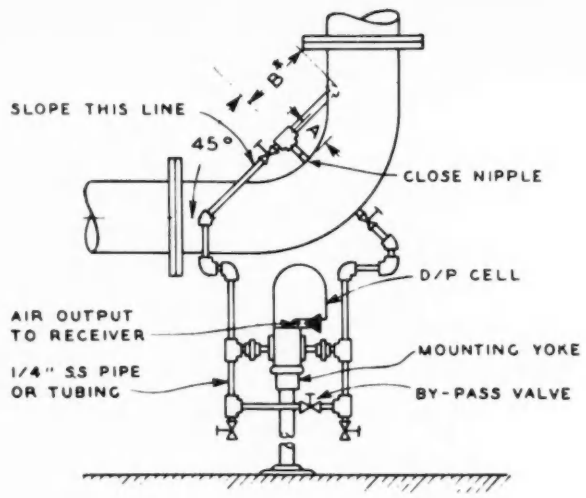
However, in the case of beam dyeing there is the additional problem of "blowing", or the separation of yarns due to excessive pressure. There are times during the dyeing cycle, even at minimum flow, when a temporary build-up of pressure is sufficient to "blow" the beam. The addition of a pressure controller will prevent this damage by overriding the flow controller. These devices have made a great contribution toward better dyeing.

One concern could not obtain good dyeing even with full instrumentation (except for flow). The first day's operation after continuous flow measurement was installed found the trouble—low dye liquor flow. The four-way reversal valve was leaking and the dye liquor was bypassing the yarn, returning directly to the pump.

In other instances, mistakes have been found in pump assembly or design. The wrong impeller was used in one, the wrong pump in another. The latter showed proper flow at room temperature, but at 200°F the flow was insufficient for good dyeing.

To guard against the possibility of insufficient flow, many machines are equipped with pumps of far greater capacity than is needed or desirable for normal flows. Also there are the combination machines for dyeing both beam and package with flows from one and one-half to six gpm per pound of yarn. With such a wide range of flow and large capacity pump, the machine operator must continuously adjust a hand throttle valve to control the flow—a very difficult task. Furthermore, without a flow meter, he has only pressure gauges to guide him. Automatic flow control remedies this situation and will also open the valve wider to maintain constant flow as the temperature goes up and the efficiency of the pump goes down.

Through the use of temperature transmitters, we are now able to record temperature on the same chart with the flow, so that the variations in both can be corrected at the same precise moment. This is particularly necessary when the flow is reversing as often as every 3 to 5 minutes.




**Elevation flow measurement in a vertical pipe elbow.**

CONTROL OF DYEING CYCLE TEMPERATURES———Dyeing procedures given by members of this Association sometimes call for raising the temperatures to a certain point, holding for five, 10, or 15 minutes, then proceeding to a higher temperature. These members probably are not aware that it now is possible to set a rate-of-temperature-rise control knob in °F per minute, thereby gradually bringing the temperature to the same end point in the same total time. This gradual increase in temperature is superior to the step procedure because there are no sudden increases in temperature.

This precise control of dyeing cycle temperatures permits matching the color sample more closely than ever before and in a shorter time. Although dyers have refused offers of new jobs in other mills because the dyehouse under consideration did not have proper controls for their dyeing equipment, actual dollars and cents savings are more difficult to prove than operating ease and convenience.

Future prospects for control are bright. Careful study is being given to complete automatic control of batch dyeing, including automatic addition of chemicals and dye. While the attempts to date have not been entirely successful, it is hoped that this direction will some day bear fruit.

STEAMING OF FABRICS——— The decating or steaming of fabrics is still a batch operation because no way has yet been devised to make it continuous. This applies to the three basic types; full-decating, semidecating and wet-decating, or potting, machines. Except for the wet decating, which may last 20 to 30 minutes, the average cycle lasts from five to 10 minutes.

Until about 10 years ago, no suitable automatic controls were available for decating machines. Today relatively few machines are sold without instrumentation of some sort. Over the years, the instrumentation has so improved that there now are compact packaged units which not only precisely control the intricate steps involved but also record each step. These records, usually on an eight-hour rotation chart, are not only for a process record but occasionally are the basis for computing the operator's piecework pay.

By automating these machines the end product is greatly improved because each piece of cloth is properly treated in exactly the same manner as the previous pieces. Just as important is the benefit to the operator. His job is easier and less tiresome. During the short process cycle of a full-decating machine there are about 17 operations, including timing and checking gauges. It is, therefore, virtually impossible for an operator to duplicate by hand, for eight hours, the exact performance of the instrument.

While quality is definitely improved, no greater production volume is obtained than a good operator can accomplish and, furthermore, the operator is still required. However, his job is easier, he is alert throughout the day to watch his product and to do other miscellaneous jobs during the process cycle. The initial cost may seem high for decating machine auto-

mation, but it is well warranted in terms of quality and operator efficiency.

CONDUCTIVITY AND pH CONTROL——In addition to the conventional instruments, some continuous cloth finishing ranges have been equipped with more complicated controls, such as conductivity and pH control. The conductivity controller will govern the adition of a solution that eliminates the need of further rinsing after the desired cleanliness or condition of fabric has been reached. Then, a pH controller regulates the addition of a second solution to assure the proper pH of the cloth leaving the finishing tank.

Here again, the addition of base chemicals by gravity flow under automatic control provides better quality without manual attention or handling. While users are understandably reluctant to release figures on chemical savings, economies are certainly effected, not only in chemicals but in hot water. Furthermore, production increases of 10 percent are not uncommon.

Good maintenance practice is essential to the success of such installations. Recent inspection of a plant equipped with conductivity and pH instruments, as well as conventional cloth finishing instrumentation, revealed that the equipment was performing like new after several years of continuous operation. Careful installation and planned preventive maintenance are prerequisites to such performance.

OTHER APPLICATIONS——There are, of course, an almost unlimited number of other applications of process instruments which cannot be covered here. Automatic make-up systems for dilute chemicals, finish compounds, etc, have only scratched the surface. Disposal systems for plant effluent lend themselves to automation. The same applies to caustic evaporators and continuous bleaching has only one remaining process variable which cannot be continuously measured and controlled.

## PRACTICAL SUGGESTIONS ON ACQUIRING NEEDED INSTRUMENT

Once the benefits of automation are fully appreciated, the next step is to plan a way to acquire the necessary instrumentation. Despite today's business conditions, the long-range instrumentation program should be planned immediately and carried out as circumstances warrant.

The first step is to recognize that instruments are necessities. Next, there should be a management-approved budget allotment in dollars or percent earnings—before dividends—for process instruments. Company directors, alert to the need for automation, will undoubtedly sanction this allotment.

An engineer should be assigned the responsibility for the instrument program. He should be given full responsibility for managing the instrument program, and approving all instrument requisitions.

This man can be of considerable help to the chemist in inaugurating wet-processing techiques. For example, when new machinery is under discussion, he can take over an automation and, with the help of the instrument companies, detail the instrument specifications. In this way, the instrumentation receives the same consideration and careful planning invariably given to new machinery.

Again, this man or someone else should set up "before and after" records to substantiate dollar savings and other benefits. These records will further justify the need for continuity in the automation program.

The planning of the instrument program is not complete without consideration of proper installation and preventive maintenance. The entire program may fail unless experienced installation and maintenance help is on hand. A somewhat basic rule used for all industry is that, when a plant has more than 25 instruments, a trained instrument man is needed. Training is provided without charge by leading instrument manufacturers. Below 25, periodic servicing by instrument company personnel is the rule.

Finally, time must be allowed to acquaint personnel with the proper use of the equipment. Machine operators must be convinced at the start that the equipment has been furnished to help make their jobs easier and more pleasant. Management can help to develop enthusiasm in their operators by keeping track of the success of the installations through regular examination of the instrument charts. Follow-up when unexplained deviations from normal readings appear is one of the best ways of letting the operators know of the mill's interest.

## CONCLUSION

Today, industry is competing for good help. It is not always the dollar sign that gets the man. The illustration of the dyer who refused a job because there were no controls on the kettles is a true one. Good working conditions, permitting a man to do a good job, using modern labor-saving tools, is the order of the day.

From a management viewpoint, the benefits cited from automation are no longer merely desirable, they are essential. They must be realized if a mill is to operate efficiently. The alternative is the "marginal mill", barely able to stay in business, penalized by the higher costs of obsolete process methods.

The way is clear. A plan for automation; implementing the plan with budget allocation; and trained personnel to assure the continued benefits of automation, without which no contemporary mill can successfully compete.


## PAPERS ON DYEING AND FINISHING WANTED

ALTHOUGH the technical program for the 1958 AATCC Convention is nearing completion, there are still some openings in the program for papers dealing with dyeing and finishing.

Individuals and/or firms desiring to present such papers at the Convention in Chicago, Oct 30-Nov 1, should send 100-200 word summaries to: Leonard J Armstrong, Varney Chemical Corp, Janesville, Wisconsin.

Oral presentation should be streamlined to a 20-minute delivery time.

## Pacific Northwest

The Pacific Northwest Section hosted national officers of AATCC at its April 22, 1958 meeting, held at the Aero Club, Portland, Ore, with Chairman Bernard R Koenig, Portland Woolen Mills, presiding.

Mr Koenig introduced George O Linberg, AATCC president; George P Paine, executive secretary, who discussed the headquarters operation at Lowell; Charles A Sylvester, chairman, Technical Committee on Research, who discussed the Association's future in research; and Charles W Dorn, chairman, Executive Committee on Research, who spoke on "The Effect of an Atomic Blast on Textiles". Mr Dorn illustrated his talk with slides.

Twenty-eight members and guests were in attendance.

**NATIONAL OFFICERS VISIT PACIFIC NORTHWEST SECTION—Seated, l to r: George P Paine, executive secretary; George O Linberg, president; Bernard R Koenig, PNW Section chairman; Charles W Dorn, chairman, Executive Committee on Research; Charles A Sylvester, chairman, Technical Committee on Research. Standing are Paul J Pernice (left), PNW secretary, and Jack D Gilberg, PNW vice chairman.**

The Section's outing will be held August 9 at the Mt Hood Golf and Country Club.

## Employment Register

58-9

*Education*: Diplomas from Biella Professional School, Ecole Superieure de Chimique Textile Roubaix, and St Gal (Swiss Chemistry School of Analysis).

*Experience*: Wool finisher, sorter; dyer, wool tops and piece goods, cottons, synthetics, piece goods packages and skeins; consultant. Languages: Italian, English, French, some Spanish.

*Age*: 51; no dependents; references.

*Position desired*: Dyemaster, woolen mill.

*Location desired*: Open, USA.

58-10

*Education*: Chemistry, physics, engineering, Wigan College of Technology; dyeing, Manchester College of Technology; plastics chemistry, McGill Univ.

*Experience*: Foreman-dyer, English dyeing firm; assistant manager, prominent English firm of bleachers, dyers and finishers; superintendent, general superintendent, consultant, Canadian cotton mills; general manager, large USA textile manufacturer.

*Age*: 50; married; references.

*Position desired*: Management, superintending or consulting.

*Location desired*: Open, USA.

58-11

*Education*: St Anslem's College, chemistry; Lowell Technological Institute, BS, textile chemistry.

*Experience*: 8 years' well-rounded experience all departments, all fibers, as chemist colorist for textile printing company.

*Age*: 36; married; 5 dependents; references.

*Position desired*: Textile chemist; development; demonstration; technical service.

*Location desired*: New England or Middle Atlantic States.

## AATCC Calendar

**COUNCIL**
Sept 19 (Charlotte, NC); October 30 (Conrad Hilton Hotel, Chicago, Ill); May 1959 (Montreal, Canada)

**NATIONAL CONVENTIONS**
Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY); 1962 (Southern Region)

**DELAWARE VALLEY SECTION**
Sept 12 (Wilmington Meeting), Oct 17, Dec 5

**HUDSON-MOHAWK SECTION**
June 20 (Annual Outing, Antler's Country Club, Ft Johnson, NY)

**METROPOLITAN SECTION**
June 6 (Outing, North Jersey Country Club, Wayne Township, NJ)

**MID-WEST SECTION**
June 13-14 (Outing—Browns Lake Resort, Burlington, Wis)

**NIAGARA FRONTIER SECTION**
June 27 (Annual outing); Sept 26 (Niagara Falls, Ont); Oct 24 (joint meeting with CATCC at St Catherines, Ont)

**NORTHERN NEW ENGLAND SECTION**
Sept 12 (Outing—Wachusett Country Club, West Boylston, Mass); Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

**PIEDMONT SECTION**
June 6-8 (Outing—Grove Park Inn, Asheville, NC); Sept 19-20 (Hotel Charlotte, Charlotte, NC)

**RHODE ISLAND SECTION**
June 13 (25th Annual Outing—Wannamoisett Country Club); Sept 26 (Management Night—Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

**SOUTH CENTRAL SECTION**
Sept 13 (Hotel Patten, Chattanooga, Tenn)

**SOUTHEASTERN SECTION**
June 6-7 (Summer outing—Radium Springs Lodge, Radium Springs, Ga); Sept 13 (Ida Cason Callaway Gardens, Chipley, Ga); Dec 6 (Atlanta, Ga)

**WESTERN NEW ENGLAND SECTION**
June 13 (Outing—Wallingford Country Club, Wallingford, Conn); Sept 26 (Hartford, Conn); Oct 24 (Annual Meeting—Rapp's Restaurant, Shelton, Conn; Dec 5 (Rapp's Restaurant, Shelton, Conn)

# News of the Trade

## Survey Reveals Impact of "Wash and Wear"

75% of the women questioned claimed they have owned or received a "wash & wear" garment of some type, according to Dean Foster, director of laboratories, United States Testing Company, as a result of a survey conducted by the Company in the New York area to determine the consumers acquaintance and attitude towards "wash & wear".

It was revealed by Dr Foster that for more than one third of the people surveyed, "wash & wear" apparel was known to them three years ago; one third, two years ago and the rest had become acquainted within the last year. Dresses, blouses, jackets and men's shirts were the major "wash & wear" items purchased.

30% have owned a drip-dry garment. Generally, a resistance to the drip-dry concept was noted. In response to the question, "are you willing to pay more for "wash & wear" garments?", 55% said yes and 45% no. Many qualify their response by indicating that, for truly "wash & wear", they would be willing to pay a premium. Orlon, Dacron, Dacron-cotton are associated with "wash & wear" by the majority. Resin-treated cottons, cotton and viscose, silicone-treated cottons are not associated with "wash & wear". In response to the question, "What are the principal qualities of "wash & wear?", the answer was reduction in ironing time, economy, convenience, quick to clean, easier to clean.

When asked about its advantages, most consumers referred to the fact that "wash & wear" claims are not always true, or they have had to iron and the label should so state. The labels are not complete enough for proper care. A few mentioned that they perspire too much when wearing "wash & wear" clothing. Others criticize "wash & wear" by saying that the finish does not seem to be permanent and that the wrinkles created during washing are hard to remove. What do the consumers want on a label? The majority asked for explicit directions for laundering. Others asked for a complete labeling of fabric content.

90% of those questioned owned some type of washing machine—average age four years. 20% owned dryers; 6% had washer-dryer combinations. The majority had used washing machines for "wash & wear" garments; only 22% had tumble dried.

**Located at the company's headquarters in suburban Wilmington, Del, this new $3,000,000 facility will provide quarters for Atlas' expanded program of basic research and chemical product development.**

## Atlas Powder Dedicates New Technical Center

Atlas Powder Company dedicated its new Technical Center in a short ceremony held May 23rd at the company headquarters in suburban Wilmington, Del. The $3,000,000 facility, located next to the company's general office, which was opened three years ago, will house the company's basic research and chemical product development activities.

Delaware Governor J Caleb Boggs spoke briefly at the dedication, which was attended by 150 local industrial and civic leaders, 600 employees and members of the press.

Atlas President Ralph K Gottshall thanked the men and women of Atlas whose work helped make the Technical Center possible. He told the employees and guests that the Technical Center is essential to the continuing growth of the company. The new products that will come from this facility, he said, will broaden Atlas' base of operations and greatly stimulate Atlas' growth.

## Prices of Pluronics, Tetronics Reduced

The Michigan Alkali Division of Wyandotte Chemicals Corporation has reduced prices on both the Pluronic and Tetronic block polymers.

Since May 15, the company has been shipping these products on a freight prepaid and allowed basis within the United States.

Price reductions for the Pluronic series amount to 1¢ per lb in drum quantities for most grades and approximately 1/4¢ per lb for some grades in tank-car quantities.

Tank-car prices of the Tetronic series have been reduced 1-1/4 per lb; cl—3¢ per lb; and lcl—4¢ per lb for most grades.

Detailed price sheets for each of these series of block polymers are available upon request. Address inquiry to Wyandotte Chemicals Corporation, M A Division, Technical Inquiry Section, Wyandotte, Mich.

## J E Sirrine Elects Officers

At a recent directors meeting of the J E Sirrine Co, consulting engineering firm of Greenville, SC, the following officers were elected: A S Bedell, chairman of the board; R R Adams, president; A D Asbury, vice president and secretary; J H Bringhurst Jr, G W Cumbus, H S Forrester, D G Moon, G R Morgan, M M Stokely, H C Swannell and George Wrigley Jr, vice presidents; J L Roberson Jr, treasurer.

The directors meeting followed the company's annual stockholders meeting, at which 45 of the 49 company stockholders attended.

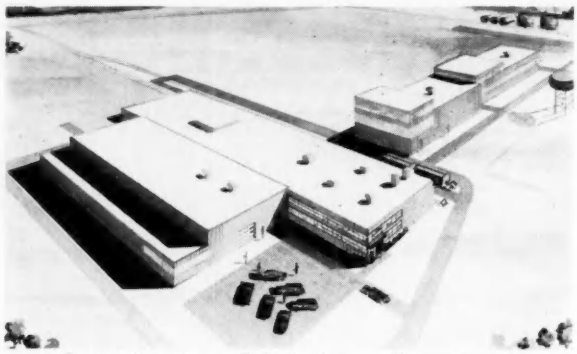
Founded in 1922 by Joseph Emory Sirrine, the Company was active in its early years in enlarging the textile industry in the South. The organization was changed from a proprietorship to a partnership in 1921. The firm continued to grow and in 1937 the partnership was broadened. At three subsequent periods additional partners were admitted, and at one time the firm included fourteen partners. Early in 1956, the firm was incorporated and additional employees became stockholders, so that today approximately 25 percent of the more than 200 employees are stockholders in the business.

Among leading textile projects that J E Sirrine Company has engineered are the American Thread plant at Sevier, N C; Cone's Carlisle Finishing Company at Carlisle, S C; J P Stevens' Delta Finishing Company at Wallace, S C; Coats & Clark finishing plant at Toccoa, Ga, plus many of the early landmark mills throughout the South.

## Shell Announces New Prices

Shell Chemical Corp, New York, has announced the following price schedules for its monoallylamine, diallylamine, and triallylamine: 99.5 ¢/lb drums lcl; 98.5 ¢/lb drums cl; 96 ¢/lb tanks.

The company's bicycloheptadiene now sells for $1.10 lb drums lcl.



Conception of new D & A plant at Owensboro, Ky

## Dewey and Almy Organic Chemicals Plant Announced

Plans to build a new plant at Owensboro, Ky, which will more than double present capacity for vinyl acetate polymers and copolymers and styrene-butadiene copolymer latices, have been announced by the Dewey and Almy Chemical Company Division of W R Grace & Co. The new plant, together with a battery separator plant at the same site, reportedly will cost about $4,000,000.

Construction on a 143-acre tract bordering the Ohio River started in May. The new plant is expected to begin operations early in 1959. It will manufacture Darex vinyl acetate polymers and Everflex vinyl acetate copolymers for textile sizing, and Darex styrene-butadiene copolymer latices for rug backing, impregnated fabrics, and foam rubber.

Other organic chemicals manufactured by the company, but which will not be produced at Owensboro, are Daxad dispersing agents and Darex plasticizers. Existing production facilities for organic chemicals at Cambridge and Acton, Mass, have recently been enlarged.

## PTI Textile Seminar

A textile seminar entitled "Textiles, U S A", cosponsored by the Philadelphia Textile Institute and the National Association of Wool Manufacturers Collateral Group, will be held beginning Monday, June 9 to Friday, June 13, at the Philadelphia Textile Institute.

Registration and room assignments will be held on Monday morning with the first lecture to begin at the afternoon session. Sessions will then continue every morning and afternoon, ending with the Friday morning session.

Inquiries should be forwarded to "Textiles, U S A", c/o Alan M Richter, director of public relations, Philadelphia Textile Institute, School House Lane and Henry Avenue, Philadelphia 44, Pa.

## Contract Research Will Test Use of Metallic Compounds To Treat Cotton Fabrics

Application of metal compounds to give cotton fabrics better resistance to weathering, mildew, and rot, added flame resistance, and increased water repellency will be undertaken by the Texas Woman's University, Denton, Tex, under a research contract with the U S Department of Agriculture.

The contract was negotiated for USDA by the Southern Utilization Research and Development Division of the Agricultural Research Service, New Orleans, La.

In a previous study, research workers screened a large number of metallic compounds, potentially valuable for use on cotton fabrics, in laboratory-scale tests. Several of the most promising of these chemicals have been selected for more extensive experiments, and the properties of cotton fabrics treated with them will be evaluated.

The screening experiments indicated that hydroxides of aluminum, magnesium, and cobalt, and cobalt metaborate may be able to give cotton greatly improved resistance to weathering, mildew, and rot. Aluminum and magnesium hydroxides also provide added flame resistance, and cobalt metaborate increases the water repellency of cotton fabric.

The contract research now planned is aimed at determining whether it is feasible to use these compounds to improve cotton fabrics of various kinds for both indoor and outdoor uses. This project is part of a broad program conducted by the Southern Utilization Research and Development Division to increase consumption of cotton through new or improved uses.

Work under the contract will be supervised for USDA by Wilson A Reeves, in charge of the Southern Division's cotton chemical modification studies, and for Texas Woman's University by Pauline Beery Mack and Ramon Esteve.

## Cyanamid to Build New Anthraquinone Facility

American Cyanamid Company will build a multi-million dollar anthraquinone manufacturing facility at its Bound Brook, N J, plant, using a completely new process developed in the company's research laboratories. The new unit will be operated by Cyanamid's Organic Chemicals Division.

It is estimated that Cyanamid's overall capital expenditure for plant modernization and expansion will be in the range of $50,000,000 to $75,000,000 during 1958. The company devoted nearly $84,000,000 to a similar program in 1957.

The plant, which will replace and expand existing anthraquinone facilities, will also provide additional production capacity for making methyl anthraquinone, napthoquinone and phthalic anhydride. With its completion, Cyanamid reportedly will become the only commercial producer of napthoquinone in this country.

An outdoor-type continuous processing installation with panel-board control, the new plant will cover approximately two acres. Its new manufacturing process, known as the napthoquinone process, involves the direct oxidation of napthalene in a fixed-bed catalytic converter. Development work on the process has been in progress for about six years. Its practicality reportedly has been successfully demonstrated in pilot-plant operations.

Cyanamid's Engineering and Construction Division will supervise the design and construction of the new anthraquinone plant for which ground will be broken in a few weeks. It is expected to be completed late in 1959. Design provides for expansion in the future.

## Eaton, Detroit, Appointed Agent for A-C Polyethylene

Eaton Chemical and Dyestuff Co, Detroit, Mich, has been appointed agent for the Semet-Solvay Petrochemical Division, Allied Chemical Corp. Eaton Chemical will market A-C Polyethylene 6 and 629 in the State of Michigan.

A-C Polyethylene is a low molecular weight polymer available in hot melt and emulsifiable forms in both uniform cube and atomized grades.

Eaton's representation in Michigan will supplement Semet-Solvay's present sales efforts in the area.

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**—get exact formulation for every textile processing need!**

When you order from Jacques Wolf you get the detergent that's exactly right for your particular fabric—not a substitute that's almost right! That's because Jacques Wolf has a vast range of detergents that meet all the needs of today's tremendous variety in textiles. No need to "juggle" them around and send you "second best." What's more, prices are much lower due to recent production advances. In addition, new detergents are always being added to the line. Most important, Jacques Wolf gives you a free Custom-Formulating Service to make detergents to your precise specifications whenever you need them!

Typical detergent formulations—
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SELLOGEN CONC. Sodium Oleyl Methyl Tauride
ORATOL L 48* Sulphonated Amide
PARNOL* Sodium Dodecyl Benzene Sulphonate (Powder and Liquid)
SELLOGEN H R* Alkyl Naphthalene Sulphonate
DETERGENT 0-245 Non-ionic Fatty Acid Condensate
BENSAPOL* Anionic Textile Scouring Agent
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# JERSEY STATE
## CHEMICAL COMPANY

producers of textile chemicals for

- Wearing Apparel
- Carpeting
- Upholstery Fabrics
- Draperies
- Industrial Fabrics
- Backings

**RESIN 500**

a modified high molecular weight urea formaldehyde surface resin for providing stiffness. Used with U-F Resin, it produces a bulky linen-like hand on all viscose or viscose cotton and acetate blends.

**RESIN JS**

a highly condensed U-F Resin stiffening agent to produce a thinner, less bulky hand than **Resin 500.** Extremely stable, it can be stored for long periods.

**RESIN 350**

a methylated, precondensed durable U-F Resin for firm-finishing Nylon, Dacron, and blended marquisettes, sheers, and taffetas. It is non-yellowing, provides stiffness without mark-off, and has low viscosity to reduce window-paning danger.

**RESIN 612**

methylated to a higher degree than **Resin 350,** its extreme stiffening properties make it the ultimate agent in its chemical class for hydrophobic fibers. Extremely durable to washing, it does not mark-off.

**CRILICONS***

a versatile line of acrylic and acrylic copolymer resin emulsions, adaptable as components for finishing wash-n-wear fabrics or back filling for carpets, upholstery fabrics or denims. Other features include stability to washing, non-yellowing, greater dimensional stability and wrinkle recovery, absence of flaking, and rich, full hand.

**JESCOFIX**

a substantive resinous compound to fix direct colors on cotton and rayon, reduce bleeding and crocking, and increase fastness to washing, perspiration and wet-pressing. **Jescofix** prevents the migration of dyestuffs on cross-dyed fabrics and prints.

**RIBBON FINISH RF**

a water soluble alkyd resin used mainly as a non-mark-off, high luster finish for acetates. Combined with anionic softeners for a variety of hand effects, its finishes are unaffected by atmospheric changes. No curing required. Also available as **Resin 418** to produce a softer hand without addition of softeners, and as **Ribbon Finish Base,** a more stable concentrate of **Ribbon Finish RF,** ideal when storage is required.

**RESIN 107**

a polyvinyl acetate emulsion, stiffens without curing, can be used with softeners, water-repellents, weighters, and binders, and is durable to low temperature washings. **Resin 107** will not exhaust in long baths; its formulations are generally run cold and are pad applications.

**CATOMER VA**

a plus-value cationic polyvinyl acetate emulsion for binding and stiffening; it is substantive and can be applied from a long bath. Cationic softeners and delustering agents can be used in the same bath, for a superior polyvinyl acetate emulsion providing the following outstanding features: 1. Freeze-thaw stability. 2. Low viscosity at high solids. 3. Narrow particle size distribution resulting in improved performance characteristics. 4. Excellent emulsion stability with no tendency to settle or cream. 5. Less sticking to forms or metal parts.

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**PRIME MANUFACTURERS OF**
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*T.M. Jersey State Chemical Co.




June 2, 1958

# • NEW PRODUCTS AND DEVELOPMENTS •

## Improved Method for Dyeing Acrilan with Cationics

An improved method for the application of cationic dyestuffs to Acrilan acrylic fiber has been developed at the Chemstrand Corporation's Research and Development Center, according to an announcement by Walter H Hindle, associate director in charge of the textile research departments.

Hindle said it has been found that, by applying the cationic dyestuffs under weakly alkaline conditions, "very substantial increases in color value can be obtained in shorter dyeing times".

The medium used to provide the optimum pH conditions is urea, which is employed to the extent of 3% on weight of fabric, Hindle continued. This gives a pH of 6.5 at the beginning of the dyeing operation, rising to 7.5 as dyeing proceeds. This range of pH values covers those considered to be optimum for the dyeing of Acrilan with cationic dyestuffs.

"Under these conditions and in the presence of 1% Capracyl Leveling Salt, 30 to 40% better color value is obtained, frequently with improved lightfastness and in shorter dyeing times than heretofore," Hindle said.

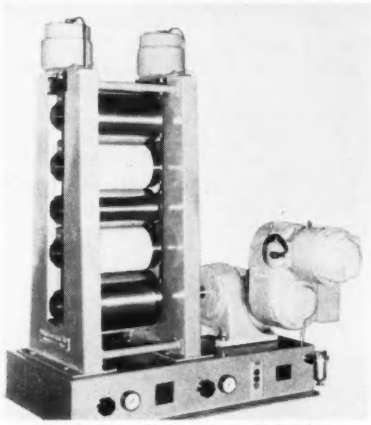
## New Carbide Amines

Two new amines, 1,3-diaminopropane and imino-bis-propylamine, have been introduced by Union Carbide Chemicals Company, Division of Union Carbide Corporation.

1,3-Diaminopropane, a water-white liquid which is said to be completely soluble in water and common organic solvents, is described as a raw material for textile crease-resistant resins with improved scorch-resistant properties. Since the compound has bifunctional amine groups, it is also of interest as an intermediate in the synthesis of dyestuffs, ion exchange resins, surfactants, etc.

Imino-bis-propylamine is expected to be of value as a raw material in the production of textile softeners, paper-treating resins, and ion exchange resins. Its structure also suggests its possible use in the synthesis of such products as dyestuffs and surfactants, and as a catalyst for polymerization reactions. This new amine is a colorless, high-boiling liquid which is said to be completely soluble in water and common organic solvents.

Both 1,3-diaminopropane and imino-bis-propylamine are available in commercial quantities.



Birch Bros Laboratory Calender

## 5-roll Laboratory Calender

Birch Brothers, Inc, Somerville, Mass, has announced a new 5-roll calender for laboratory use, which features unit design principles. It reportedly is furnished as a complete, ready-to-operate package and incorporates either a constant or mechanical variable speed drive complete with magnetic reversing starter and panel-mounted push-button station, full pneumatic controls panel mounted for accessibility and allowing individual pressure control to each side of the rolls for either uniform or graduated loading, complete wiring and piping, and variable loading to 500 pounds per linear inch of face. Like other Birch laboratory machines, it is made for table or bench top mounting.

Optional equipment available consists of center wind and friction let-off, supporting stand, and rolls to suit individual applications.

## Improved Water-Skipper

Textile Adjuncts Corp, 876 Pacific St, Brooklyn 38, NY, has announced the introduction of a new, improved antiresin-deposit agent in a 16-ounce aerosol can. The product bears the trade-mark, Water-Skipper, which was introduced to the textile industry three years ago in a large, five-pound aerosol cylinder.

The product is said to be the only special aerosol treatment that is designed and formulated for mill use. Water-Skipper is now improved by the use of a methyl tung oil ester combined with organic silicones. The aerosol is spray-applied to all metal surfaces that contact uncured resins. The molecular coating of Water-Skipper on metal surfaces reportedly helps to prevent layer build-up of polymerized resins since the product acts as a hydrophobic coating and the contacting wetted cloth contains water-soluble resins to assist in its action. It is suggested that Water-Skipper application means that tenter frame clips, dry-can surfaces, calender-roll surfaces, etc, can be easily treated on the spot to reduce or completely eliminate resin build-up.

The new Water-Skipper can be applied to hot or cold metal surfaces to reduce or eliminate resin build-up. The surfaces to be treated should be clean, without deep scratches, and free of moisture. Water-Skipper dries to a non-oily, non-stain, non-lacquering film that can be removed only by cloth friction, it is stated.

One treatment of Water-Skipper reportedly will last approximately one week; however, spot treatment may be required under some circumstances. Sticking clips, or areas showing pull-outs can be individually sprayed while the frame is still in operation. The period between retreatment of surfaces to prevent resin build-up depends upon the type of material being finished, the number of yards being run, and the type of resin being applied. It is claimed that, in some mills, where metal surfaces are rinsed with hot water after each day to remove clinging deposits of resin, retreatment is not necessary for two or three weeks. Since many large mills run their frames continuously, such housekeeping practices are impossible; however, the use of Water-Skipper will probably reduce clean-up of resin by 50%, it is stated. In some mills using extremely concentrated resins, it is suggested that Water-Skipper be applied very heavy to metal surfaces.

Water-Skipper is also applicable to the treatment of rusty metal surfaces to remove surface rust as well as preventing further rust formation. It is also a product designed to reduce friction between metal surfaces, thus a lubricant for all friction bearings. Laboratory tests reportedly have shown that Water-Skipper prevents acids and bases from effecting aluminum surfaces, as well as offering protection to metals against atmospheric corrosion.

Many new applications for the product are suggested in a technical bulletin, which is available on request from Textile Adjuncts Corp. The product is sold and distributed by TAC or Crown Chemical Corp, 240 India St, Providence, RI.

## Cibanone Brilliant Orange GR Paste

Ciba Co, Inc, has added a new vat dye with a bright orange shade to the Cibanone Microfined group. The new dye, Cibanone Brilliant Orange GR Paste, is said to have an exceptionally clear, slightly reddish orange shade, with high tinctorial value and build-up for heavy shades. The dye's good all-round fastness properties are paced by a Fade-Ometer rating of 250 hours or better in medium depth dyeings, it is claimed. Crockfastness and washfastness are said to be equally outstanding.

Cibanone Brilliant Orange GR Paste should prove an important member of the Cibanone dye series. Ciba states that the product's excellent dyeing properties lead to clean, strong shades in pigment or reduced dyeing by jig, pad, package machine or open-bath methods. It is further stated that dyeings and prints featuring tangerine tones and related hues can be easily produced on dress goods, draperies and upholstery fabrics. Good coverage of dead cotton by Orange GR Paste reportedly prevents shade variation resulting from this factor.

Dyeings of goods for personal wear and home furnishings with Cibanone Brilliant Orange GR Paste reportedly show strong resistance to color change or fading in the hard wear and cleaning customarily given these materials.

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## Polylube FFN

Laurel Soap Manufacturing Co, Inc has developed and is now introducing its new Polylube FFN, a nonionically dispersed polyethylene emulsion.

Polylube FFN is claimed to have wide versatility for effective softening and lubricating of cotton, rayon, and synthetic yarns and fabrics. Said to be ideal as a speed sewing thread lubricant, it also reportedly imparts a soft, springy hand and improved drapability when applied to piece goods. Sewing and cutting properties are also vastly improved, it is stated.

Applied to resin-treated goods, Polylube FFN is said to materially increase tear strength and crease resistance. It is reported to be stable to acids, alkalis, and salts over long periods, even in high concentrations. Forming dispersions almost colloidal in particle size, it is said to assure uniform application and penetration. It may be considered a semipermanent finish since it is reported to be highly resistant to laundering under normal conditions.

## Neutrogene Black B

Francolor Inc, Woonsocket, RI, has placed on the US market a new neutrogene which complete its line. Neutrogene Black B is described as a special patented azoic black which is especially stabilized so that it may be developed by neutral aging to a full shade.

It reportedly has found ready acceptance in the trade for use with the new fiber-reactive dyes in view of its excellent fall-out qualities when used with these colors and because of its economy. It yields a very deep black at 6 to 8%.

Neutrogene Black B is a timely complement to the Neutrogene range which is said to be finding widespread acceptance for use by neutral aging either in lieu of or in association with vat dyestuffs where lower costs are sought. They reportedly can be used as fall-on with fiber-reactive dyes; in straight application where pure whites are desired which cannot be obtained with standard azoic colors; as resists under aniline black, where exceptional brightness is achieved; or for flash aging (10 seconds) where the Riegel Flash Ager is available, to increase aging capacity and speed. All Neutrogenes and Neutrogene VA's may be developed by standard acid aging, it is claimed.

Francolor notes that the brightness of the Neutrogene VA's makes them ideal for the new popular bright shades.

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## Moropol 762

Moretex Chemical Products, Spartanburg, SC, has added a new durable resin softener, Moropol 762, to its line of products.

Moropol 762 is an emulsified epoxy type plasticizer, which, it is claimed, will increase the tear strength and add to the crease angle of resin-treated fabrics. It is described as a nitrogen-free nonionic emulsion compatible with other materials used in resin baths.

Early production trials reportedly have shown that Moropol 762 has the added feature that it will not retain soil in a laundering operation. Moretex states that this feature recommends its use on white goods in preference to acrylate, silicone and polyethylene softness. Properties obtained, such as abrasion resistance, tear strength, etc, reportedly are durable for the life of the fabric.

Moropol 762 is available in 55-gallon drum containers.

## Specosoft R

Independent Chemical Corp, 70-30 79th Place, Glendale, Brooklyn 27, NY, has introduced a new polyethylene emulsion type softener. Designated Specosoft R, the new prepared emulsion is intended for use in textile finishing where softness of hand and drape is required. Outstanding properties claimed for Specosoft R are: 1) no tendency to yellow or discolor nylon, Banlon, Orlon, wool or cotton; 2) excellent resistance to water spotting; and 3) no tendency to scorch when exposed to high temperature.

Specosoft R is chemically nonionic and reportedly can be incorporated with resins and other finishing agents. It also is said to impart excellent lubrication to the fibers, which produces better sewability by helping to prevent needle cutting.

Specosoft R, when used with resins, reportedly imparts lubrication and higher tear strength. It is pourable and is said to have good durability to washing.

---

## Oakite Airefiner No. 54

Building of slime, algae, corrosion, and scale in air conditioning, humidifying, and heat exchange equipment may be prevented by the use of new Oakite Airefiner No. 54, according to the manufacturers, Oakite Products, Inc.

Used at concentrations of two to four pounds per 1000 gallons of water, Oakite Airefiner No. 54 reportedly controls scale, keeps the pH of water in the low alkaline range, minimizes delignification of wooden cooling towers and the deposit of white coatings on equipment. Completely soluble in hot or cold water, the material is not toxic in recommended solution and is unaffected by heat, it is claimed.

It may be sprayed through humidifying systems into the atmosphere in textile and similar installations.

Further information is available from Oakite Products, Inc, 19 Rector Street, New York 6, NY.

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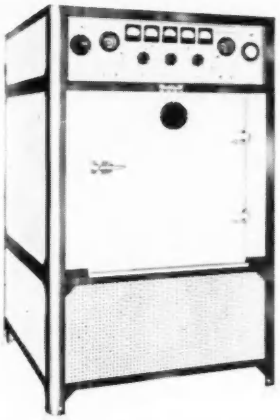
## New Phthaloyl Chlorides

High purity isophthaloyl chloride and terephthaloyl chloride are now available in pilot-plant quantities from Hooker Chemical Corp, Niagara Falls, NY. In view of projected commercial-scale prices, these chemicals are expected to be important raw materials for synthetic fibers, and protective coatings. They should also prove useful in the chemical and dyestuffs fields.

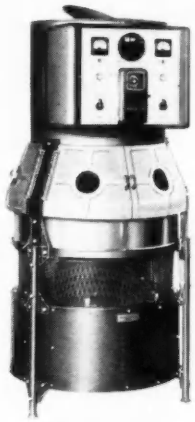


### WEATHER-OMETER®

The Weather-Ometer is a laboratory apparatus for ascertaining at a greatly accelerated speed the trend of reactions which will occur on all types of products in outdoor exposures.

It is a self-contained machine, employing the three principal weathering agents: synthetic sunlight, moisture and temperature changes.

Automatic control, regulation and application of these weathering agents make it possible to establish standard test conditions which can be duplicated and reproduced at any time or place.



### FADE-OMETER®

The Fade-Ometer is a patented self-contained electrically operated device for determining by accelerated tests in the laboratory the action of sunlight on all materials.

The enclosed violet carbon arc, source of radiant energy, provides noon June sunlight 24 hours per day. The Fade-Ometer provides constant, uniform and reproducible conditions regardless of time or place, thus speeding up research and production and insuring quality of product.

### LAUNDER-OMETER®

The Launder-Ometer is the standard laboratory washing machine of the AATCC and is used for quickly determining the color-fastness of textiles to commercial laundering and domestic washing.

From one to twenty samples may be tested simultaneously under controlled conditions of temperature and mechanical action.

All Launder-Ometers have full automatic control with a choice of electricity, gas or steam for heating the water bath. A pre-heating and loading table is provided to save time and for added efficiency.

# Atlas-Ometers

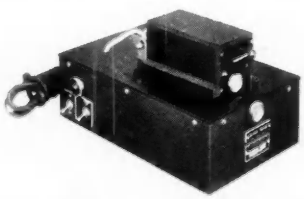
Standard laboratory instruments for speedily determining the durability and end-use performance of materials subjected to the deteriorating effect of sunlight, weathering, washing and wearing. Used throughout the world. Indispensable for fast, reliable, testing in product development and quality control in production. Exact standardized test programs can be repeated as frequently as required.

**Complete catalog on each machine available upon request**

*Sole Manufacturers*

**ATLAS ELECTRIC DEVICES CO., 4114 N. Ravenswood Avenue, Chicago 13, Illinois, U.S.A.**

*Sales representatives in principal cities throughout the world*



### SCORCH TESTER

Standard machine for testing damage caused by retained chlorine. AATCC Tentative Test Method 69-52.

The damaging action of retained chlorine is determined by treating specimens in dilute sodium hypochlorite solution, pressing between hot metal plates, and then making breaking strength measurements on treated and untreated specimens.

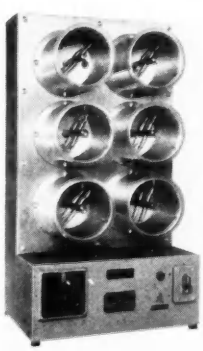
It is applicable to any cellulosic textile fabric which may or may not have been treated with resin.

### ACCELEROTOR®

An AATCC developed instrument for rapid evaluation of wet and dry abrasion qualities of woven, non-woven, knitted and coated fabrics.

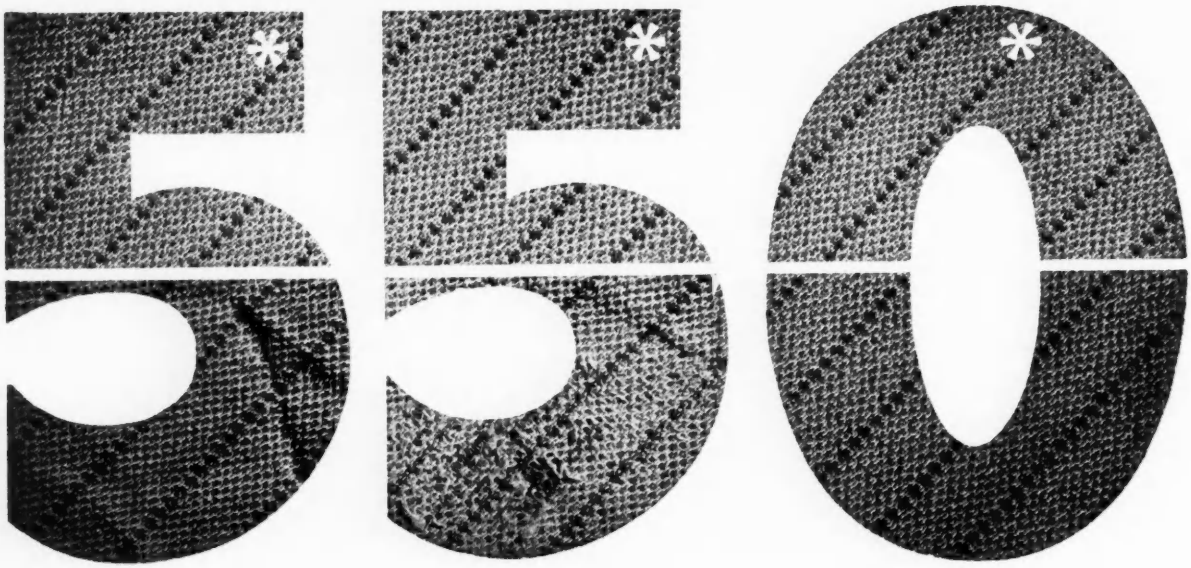
Combines the actions of flexing, tumbling and random motion to produce abrasion from fiber against fiber as well as fiber against various abradent materials. Evaluations can be made of loss of color, weight, tensile strength and changes in dimension and hand.

Test completed in three to six minutes. Permits alternate tests of washing or dry cleaning combined with dry abrasion.



### RANDOM TUMBLE PILLING TESTER

A new laboratory instrument for evaluating the pilling and fuzzing characteristics of all types of fabrics.




# THE WICA REACTANT RESIN!

**FIVE**

Hangs-out five times better than untreated fabric . . . all for less than a fifth of the cost of lost buyers when the market demands full blown-up feel of reactant resin results.

**FIVE**

"Formidable" resistance is offered to surface abrasion . . . tensile strength, resiliency and hand is substantially increased . . .vitality of fabric is dramatically improved . . . each fibre is reinforced with penetration of WICA reactant resin 550 throughout.

**ZERO**

Dyed shades are effected negligibly . . . nothing impedes fabric's breathing with WICA resin 550 . . . voided orders are unheard of with alive, easy handling fabric treated with WICA reactant resin 550.

*We will treat a sample of your fabrics on request.*

Wica

SPECTRUM ACCURACY

**WICA CHEMICALS, INCORPORATED, OLD CONCORD ROAD • CHARLOTTE, NORTH CAROLINA**

synthetic organic chemicals • textile specialties • latices • adhesives

# • NAMES IN THE NEWS •

Brommelsiek

**William F Brommelsiek** has been appointed dyehouse manager and group leader in the dyeing and finishing department of the Chemstrand Corporation's Research and Development Division.

He will supervise activities at Chemstrand's new commercial demonstration dyehouse at Decatur, Ala, which provides Chemstrand research with full production facilities for dyeing and finishing of fabrics.

Prior to joining Chemstrand, Mr Brommelsiek was assistant director of research for Forstmann Woolen Company, Passaic, NJ. While with Forstmann, he authored a number of technical papers on dyeing techniques and is the codeveloper of a method for continuous stock dyeing using indigo.

---

**T Frederick Broadhurst Jr**, will represent W F Fancourt Co and Fabulized, Inc. in Tennessee and other states in the south central section.

Mr Broadhurst was formerly with Joseph Bancroft and Sons, Inc in Wilmington, Del. He will be located in Chattanooga.

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**Charles F Blaich Jr** has joined the sales department of the Carwin Company, North Haven, Conn, as technical representative, responsible for sale and market development of Carwin's line of special isocyanates and other chemicals for use in polymer manufacture.

Mr Blaich has a background of sales and sales development experience with DuPont's Finishes Department and Armour Chemical Division.

---

**Worth G Kirkman** has joined the Dow Chemical Company's textile research staff at Williamsburg, Va.

Kirkman, formerly a superintendent with Pilot Mills Co, Raleigh, NC, has joined Dow as a research engineer.

Greenwall

Dillon

Pascal

The board of directors of National Starch Products Inc has elected **Frank Greenwall** chairman of the board and chief executive officer. **Donald D Pascal**, formerly executive vice president, replaces Mr Greenwall as president and chief administrative officer.

Also elected to new positions with National Starch were **James Dillon**, senior vice president; **Robert Merritt**, vice president and **Forest Teel**, executive vice president of Eli Lily, directors of the Company.

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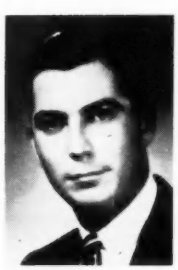
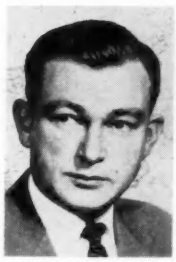


Bermudez

Appointment of **R E Bermudez** as assistant division manager of Kelco Company's central division, headquartered in Chicago at 20 Wacker Drive, has just been announced.

Mr Bermudez, formerly of New Orleans, La, had been Kelco representative in the central south for five years prior to his promotion. In his new position, Mr Bermudez will promote sales and applications development of Kelco Algin products.



Nelson

Food Machinery and Chemical Corp, Buffalo, NY, has promoted **Dewey H Nelson** to the position of division manager of Becco Chemical Division, succeeding **Frederick A Gilbert**, who was recently appointed general manager of FMC's new Inorganic Chemicals Dept, of which Becco is a part. Mr Nelson had been assistant division manager of Becco.

**Robert J DeLargey**, assistant division manager of FMC's Westvaco Chlor-Alkali Division, has been named manager of the Division. Also promoted were **James R Harris**, who becomes sales manager, and **Robert Bondurant**, who was appointed production manager.

---

Wyandotte Chemicals Corporation has named **Carl Smith** as staff assistant to the vice president, Michigan Alkali Division.

Mr Smith will assist **Bert Cremers**, vice president and general manager of the Division, in handling many of the routine activities of the Division and would also handle development coordination assignments.

Mr Smith comes to Wyandotte Chemicals from the Huron Milling Division of Hercules Powder Co, with whom he had been associated for seven years.

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**E Perkins McGuire**, assistant secretary of defense for supply and logistics and an LTI alumnus, will receive the honorary degree of doctor of science and will deliver the principal address at 60th annual commencement exercises at Lowell Technological Institute June 15. Also receiving the honorary ScD degree will be **Philip S Marden**, prominent Lowell civic leader and man of letters.

---

**Hans W Krause** has joined the Synthetic Fibers Group, Textile Fibers Dept, Union Carbide Chemicals Co, where he will be concerned with process development problems.

He was formerly with the Swiss firm, Lonza, AG.

**Goldthwait**

**Charles F Goldthwait,** retired former head of cotton chemical processing research at the Southern Utilization Research and Development Division, ARS, has been given a $1000 cash award for his development of a new type of conforming cotton bandage. The award, recommended by the ARS Incentive Awards Committee, was presented during recent ceremonies at the Division's New Orleans laboratory.

Mr Goldthwait and his coworkers spent three years developing the bandage, made of chemically modified cotton. The development cost was slight ($75,000 based on salaries and expenses) when compared to savings afforded the Government—$5 million in military procurement during 1952 alone.

Mr Goldthwait retired in July 1956, after 15 years at the New Orleans Laboratory and after more than 50 years in textile research. Since his retirement he has been visiting research professor of textile chemistry at the School of Textiles, North Carolina State College.

**Morrison**

Putnam Chemical Corp, Beacon, NY, has added **Haven A Morrison** to its New England sales force. Mr Morrison for many years was chemist and dyer at Barre Wool Combing Co, Ltd, Barre, Mass. He was formerly associated with Ciba Co, Inc, and more recently with Interchemical Corp.

## Abstracts———

(*Concluded from page 374*)

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### Japanese Versatile Fiber—Kuralon

Anon, *Pakistan Textile J* **8**, 61, 63, December, 1957

The Kurashiki Rayon Co of Osaka, Japan has issued some details regarding Kuralon, the trade name for Vinylon, a fiber produced from polyvinyl alcohol.

Kuralon is lighter than cotton and slightly lighter than silk or wool. Its tenacity is said to be the equivalent of that of natural silk or cotton. Its abrasion resistance is exceedingly good.

The fiber is stable to dilute mineral acids, alkalis, alcohols, esters, and other organic solvents. It is resistant to mildew and fungus, and to insects.

Kuralon is said to find uses in underwear, due to its soft feeling, and in socks and other knitted fabrics, owing to its warmth, high strength, and easy washability. Its durability is rated as five times that of wool and more than three times that of cotton.

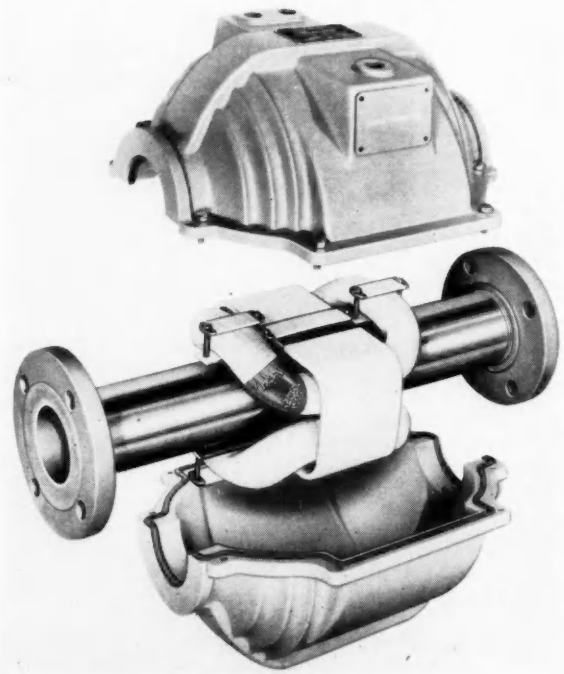
Fabric shrinkage in processing varies according to the kind of spun yarn used and the fabric construction. The fabric shrinks two to five percent in width and five to eight percent in length.

The author gives information on sizing Kuralon yarn, but omits any mention of dyeing. From other sources, however, we learn that the fiber is intermediate in dyeing behavior between cellulose fibers and typical synthetics.

An important industrial use for Kuralon is in filter cloths, due to its resistance to acids and alkalis.

### CORRECTION

Your attention is called to an error in the article "Recent Developments in Electronic Instruments for Textile Processes" by R Hosmer of The Foxboro Co. On page P330 (May 19, 1958 issue) the wrong photograph appears above the caption for Figure 2—Exploded view—magnetic flow transmitter PH 7201. The correct photograph appears below:



*Proceedings of the*

**American Association of Textile Chemists and Colorists**

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June 16, 1958

# COUNCIL REPORT

**210th Meeting • May 23, 1958 • Philadelphia, Pa.**

OFFERING evidence that AATCC is doing a major job for the textile industry in providing the means for bringing together the talents and experience of many experts, President George O Linberg opened that 210th meeting of the Council by citing the fact that this was the 32nd in a series of AATCC meetings which had been held at Philadelphia's Hotel Sheraton over a three-day period. Twenty-five of the meetings were devoted to research and technical discussions, while the other seven dealt with administrative affairs.

Mr Linberg stated, "The development and exchange of technical information through research activities and the committee structure of AATCC is the reason for our existence and the proof of our success."

After expressing gratitude to the Delaware Valley Section for its invitation to the Council to meet in Philadelphia, President Linberg stressed the importance of the national body keeping in touch with the Sections through such meetings. He went on to point out how he has tried to bring such contacts about also by means of the "team presentation," namely, visits of the president, executive secretary, and research committee chairmen to various Sections. Charles W Dorn, chairman of the Executive Committee on Research, and Charles A Sylvester, chairman of the Technical Committee on Research, have discussed the research aspects of AATCC; George P Paine, executive secretary, has covered the functions of National Headquarters and its services to Sections; and Mr Linberg has sounded calls to action for an expanded membership (both individual and corporate), Section programs to interest young people in our industry, and an effort to make the public-at-large more textile conscious.

The "team" to date has spoken before meetings of the following Sections: Delaware Valley, Metropolitan, Washington, Mid-West, Hudson-Mohawk, Pacific Northwest, and Pacific Southwest. Future visits are scheduled at Rhode Island, Southeastern, and Niagara Frontier Section meetings.

In his remarks, Mr Linberg also pointed out that, as of May 1, AATCC had the largest number of individual members in its history. At April 30th, income from individual memberships for a nine-month's period was ahead of all last year.

* * *

Reporting for the Appropriations Committee, Roland E Derby announced a recommended operating budget of $129,335 for the 1958-59 fiscal year. This decreased budget is predicated on substantial curtailment of activities in view of uncertain conditions in the industry. One principal economy effected will be the elimination of the office of assistant secretary at National Headquarters.

* * *

Charles A Sylvester, chairman of the Technical Committee on Research, reported progress in test methods for "wash and wear," colorfastness to washing, antimicrobial finishes, mercerizing, and consumer end-use.

Complete details of the wash-wear appearance test method, covering seven different methods involving the washing and drying of fabrics as done in the home, will be published shortly in the *Proceedings*. The method has been submitted for letter ballot.

Tentative test method 87-58, Accelerated Test for Colorfastness to Industrial Laundering (cotton fibers) has been approved by TCR and will appear in the 1958 *Technical Manual*.

Methods for antimicrobial finishes, mercerizing, and consumer end-use have been submitted for letter ballot.

Mr Sylvester also announced the formation of an advisory committee on statistical methods, which will be headed by George Switlyk, E I du-Pont de Nemours & Co, Inc.

* * *

ECR Chairman Dorn reported that TCR; John Siberston, Johnson & the following committee personnel changes: Nelson F Getchell, National Cotton Council to replace George S Buck Jr, National Cotton Council, on TCR; John Siberston, Johnson & Johnson, to replace P B Roth, American Cyanamid Co, as chairman of the Committee on Water Absorbency; Emil G Wiest, Du Pont, to replace P J Wood, Royce Chemical Co, as chairman of the Committee on Analytical Methods; M Joanne Spangler, Dan River Mills, to replace Charles L Zimmerman, Dan River Mills, on the Committee on Antibacterial Agents.

Joining the Committee on Nuclear Radiation are: O K Neville, Nuclear Chicago Corp; Francis M Sell, Deering Milliken Research Trust; and J C Arthur Jr, Southern Research Laboratories.

Joining the Committee on Colorfastness to Light are: Wilfred E Belanger and S H Lieb, Chrysler Corp; Edwin J Grajeck, Minnesota Mining & Mfg Co; L Ricard, Arnold, Hoffman & Co, Inc; and F T Simon, Union Carbide Chemicals Co.

* * *

The National Headquarters Laboratories, under the direction of Harold W Stiegler, director of research, are chiefly active in work for four committees: Resistance to Abrasion, Colorfastness to Washing, Dimensional Changes in Textile Fibers, and Damage Caused by Retained Chlorine.

* * *

ECR has approved the tentative program entitled "AATCC Research at Work" for the forthcoming Chicago Convention. This will take the form of a symposium under the sponsorship

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Kuralon is lighter than cotton and slightly lighter than silk or wool. Its tenacity is said to be the equivalent of that of natural silk or cotton. Its abrasion resistance is exceedingly good.

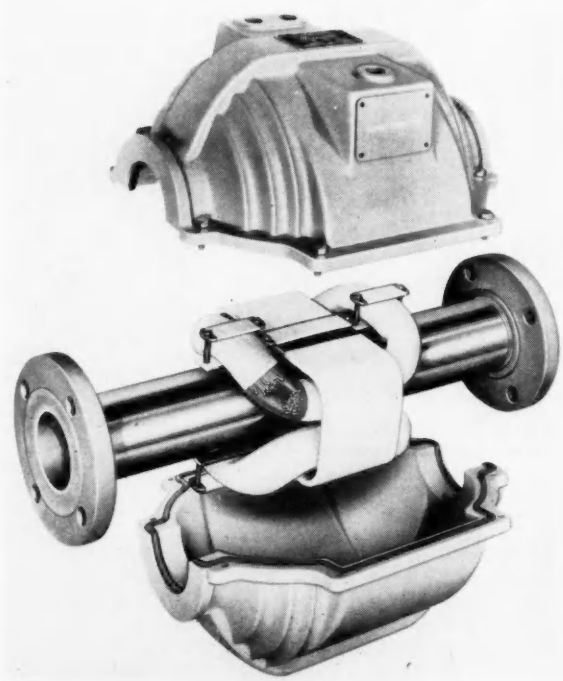
The fiber is stable to dilute mineral acids, alkalis, alcohols, esters, and other organic solvents. It is resistant to mildew and fungus, and to insects.

Kuralon is said to find uses in underwear, due to its soft feeling, and in socks and other knitted fabrics, owing to its warmth, high strength, and easy washability. Its durability is rated as five times that of wool and more than three times that of cotton.

Fabric shrinkage in processing varies according to the kind of spun yarn used and the fabric construction. The fabric shrinks two to five percent in width and five to eight percent in length.

The author gives information on sizing Kuralon yarn, but omits any mention of dyeing. From other sources, however, we learn that the fiber is intermediate in dyeing behavior between cellulose fibers and typical synthetics.

An important industrial use for Kuralon is in filter cloths, due to its resistance to acids and alkalis.

### CORRECTION

Your attention is called to an error in the article "Recent Developments in Electronic Instruments for Textile Processes" by R Hosmer of The Foxboro Co. On page P330 (May 19, 1958 issue) the wrong photograph appears above the caption for Figure 2—Exploded view—magnetic flow transmitter PH 7201. The correct photograph appears below: